ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT FOR THE PROPOSED CONSTRUCTION

OF

NZOIA II 20 MW SMALL HYDROPOWER PLANT

Proponent

JIATIAN (KENYA) COMPANY LTD

JULY 2021

Jiatian (Kenya) Company Limited is proposing to construct a 20 MW Small Hydropower Project (SHP) on River Nzoia. The proposed Hydropower Project is on Nzoia River located at about 900 metres upstream of the Webuye Bridge on Highway A104

SUBMISSION FORM

A team of Environmental experts prepared this EsIA report in accordance with the Environmental Management and Coordination Cap 387 and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019 and the Legal Notice NO. 31 of 2019. We the undersigned, do hereby certify that this report was prepared based on the information provided by the proponent as well as that collected from other primary and secondary sources and on the best understanding and interpretation of the facts by the environment experts.

We are pleased to herewith submit the EIA Report for the proposed Construction of ***Nzoia II 20 MW Small Hydropower Plant***

Lead Experts

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Sign:  **Date:** 28th September 2021

PROPONENT

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Disclaimer
This Environmental Impact Assessment Report is being submitted in accordance with the terms and conditions of contract in respect of provision of consultancy services. It has been carried out in full observance of the EIA regulations and in compliance with the Environmental Management and Coordination (Amendment) Act, 2015 and subject to terms and conditions of the National Environment Management Authority (NEMA).

EXECUTIVE SUMMARY

Introduction

Jiatian (Kenya) Company Limited is proposing to construct a 20 MW Small Hydropower Project (SHP) on River Nzoia. The proposed Hydropower Project is on Nzoia River located at about 900 metres upstream of the Webuye Bridge on Highway A104. The proposed Project is run-of-river through a weir across the river. The Ministry of Energy has approved the proposed Hydropower Project and negotiations are ongoing with other relevant institutions of the Ministry of Energy (The Kenya Electricity and Petroleum Regulatory Authority and the Kenya Power Company) for the finalization of the project negotiations and issuance of Power Purchase Agreement (PPA).

Justification for the Project

Electricity demand in the country is growing significantly mainly due to the favourable productive investment environment and increasing population of the country. The Country in its development agenda guided by its Blue Print Vision 2030 to transform the country from its present economic status of developing country to the Medium Economy by the year 2030. In this vein, the Big Four Agenda of the current Jubilee Government is meant to achieve this initiative by concentrating and committing more resources towards:

i) Affordable Housing,
ii) Universal Health Coverage
iii) Food Security and Nutrition
iv) Enhancing Manufacturing.

The electricity demand currently stands at 1600 MW against an effective supply of 1,800 MW under normal hydrological conditions. The generation capacities from various energy mixes are: The hydropower generation stands at 52.1 % (818MW) mainly generated from nine large power plants and five smaller ones (less than 10MW). The current geothermal generation is 745 MW mainly generated from Olkaria fields. Others are bagasse (cogeneration) and wind 13.2%, 1.8% and 0.4% respectively while fossil based thermal contribute about 32.5%. The current electricity demand gives a reserve margin of 238 MW (20%). However, during low hydrologic conditions, the hydropower generation is reduced, the reserve margin diminishes significantly necessitating load shedding and procurement of expensive emergency thermal power.

The peak load demand is projected to grow to about 2,600 –3600, MW by 2020 and 15,000 MW by 2030. To meet this demand, the projected installed capacity should increase

gradually to 19,169 MW by 2030.

The future power sector planning in Kenya is based on a 10-year power development program from 2014 – 2024 that places emphasis on the load forecasting, power generation and transmission planning. The program is intended to incorporate renewable energy into the power generation, especially focusing on the projects that conform to Feed–in Tariff (FIT). Demand forecasts estimate that by 2024 there will be supply insufficiency of 10,000 MW in the "Vision 2030" economic blueprint of 2030.

In the energy sector policy of 2004, the installed capacity of a run-of-river hydropower plant less than 10 MW was defined as a Small Hydropower Plant (SHP), further subdivided into small, mini (up to 1MW) and micro (up to 0.1 MW).

The SHP system is a proven renewable energy technology. The SHPs are particularly suitable energy generation in rural areas. SHP are advantageous because of short implementation times, low initial financial investments cost, low environmental negative impacts especially if the power generation is by run-of-river flow without construction of water storage reservoirs which have significant environmental negative impacts.

The run-of-river SHPs main components is a weir, diversion works for the water, delivery pipes/channels (penstock) and power house containing turbines and generator. The hydropower potential in Kenya is estimated to be around 6000MW and of this SHP contributes about 3000MW. Despite the existence of this high potential of SHP only a paltry 30MW has been installed. Translating to only 1 % of the SHP potential exploited.

In Kenya field investigations have over 50 river sites with potential for development of SHP. Most of the sites with potential SHP development are located in areas that are primarily suitable for standalone power generation systems, for off-grid supply of power to local communities and commercial enterprises in the far-flung communities in rural areas. The sites that have potential for SHP development in Kenya are situated in the five river basins: Lake Victoria Basin, Rift Valley, Athi River, Tana River and Ewaso Ng'iro River basin. These areas have high development potential and therefore ideal for SHP development. In the Central region there are streams and rivers many of them having natural falls site which are ideal for SHP development. The challenges that impede SHP development include lack of technical know-how of SHP and the potential sites for such, lack of funds by communities or private investors and drought experienced in many parts of Kenya impede interest in SHP development.

The Kenya Government is keen to increase the proportion of renewable energy in the country's energy mix, which can be proved by its relatively friendly policies, such as the

scope of renewable energy supplement application, tax exemption for renewable energy equipment, and public investment increased in geothermal exploration. All these policies are aimed at attract the investment from private sector.

The Project Objective

The development of Nzoia II Small Hydropower Plant (SHP) is very important as it is suitable to meet out the power demand of nearby villages and towns of Webuye district to provide general amenities and propriety to the local inhabitants as well as to boost up industrial and agricultural development. The development of this project shall contribute to:

i) Meet the power demand of Webuye district and avoid long-distance power transmission
ii) Electrification of un-electrified villages of Kakamega and Bungoma counties
iii) Improve basic living conditions and education standards of local population
iv) Establishment and sustenance of mini-scale and rural based cottage industries
v) Improve agricultural productivity by getting assured, reliable and stable power supply for irrigation needs.

The development of Nzoia II SHP is quite favorable of nearby area due to availability of proven technology, short gestation period of project, cheap and simple operation, no escalation in cost of production, long service life and no bad impact on environment. This would not only improve the socio-economic conditions but also help in preserving and developing a well-balanced eco-environment.

Project Location

Nzoia II Small Hydropower Plant (SHP) Project is located in the suburbs of Webuye town, on Nzoia River. The river forms border-line between Kakamega and Bungoma Counties. The weir site location coordinates are Longitude: 34˚48’39.9” E and Latitude: 0˚35’07.7” N, approximately 5km from Webuye down town, 380km from Nairobi, 861km from Mombasa harbor. The famous Webuye Waterfall is 2km upstream of this site. Figures 1-1 and 1-2 show the Project Location and the Nzoia II Small Hydropower Plant site.

i)The EIA Study Objectives

The objective of the Environmental Impact Assessment (EIA) report is to provide a synthesis of the knowledge regarding the proposed project, the current environment and social conditions in the project area, potential impacts associated with the project, mitigation measures to address identified impacts and an Environmental Management Plan to mitigate the negative impacts arising from the project implementation. The EIA objectives include:

1. Conducting an EIA to identify both positive and negative impacts of the proposed

project and propose the most appropriate mitigation measures during the construction, operation and decommissioning phases of the project.

2. Collecting baseline socio-economic data of the project area and the potential impacts expected from project construction, implementation, operation and decommissioning.
3. Developing an Environmental Monitoring Program during the construction and operation phase and present plans to minimize, mitigate or eliminate any negative effects and impacts identified.
4. Describing the Environmental Management Plan implementation mechanisms; review the power plant design and its compliance with environmental requirements.
5. Identifying and contacting the project stakeholders to seek their views on the proposed project.
6. Facilitating public open meetings for the stakeholders to air their views.
7. Compiling draft EIA report.
8. Compiling the final EIA report.
9. Submission of the final EIA report to National Environmental Management Authority (NEMA) and subsequent follow up to obtain relevant authorization/permit in order that the project can commence

The Structure of the EIA report

This EIA report is presented in 13 Chapters and six Appendices.

Chapter 1: **Introduction:** Provides Introduction to the Project.

Chapter 2: **Project Description:** Description of the River Nzoia

Chapter 3: **EIA Methodology**: Provides details on the EIA.

Chapter 4: **Applicable Regulations and Standards:** Provides details of the Institutional and Legal Framework within which the EIA is carried out including International Conventions and International Guidance and Standards.

Chapter 5: **Technical Description of the Project:** Provides the description of the development, including the technical description of the project.

Chapter 6: **Stakeholders Consultations:** Provides a summary of the stakeholders' consultations.

Chapter 7: Potential Environmental Impact and Mitigation: Provides a description of the potential environmental impacts and mitigation.

Chapter 8: Potential Social -Economic Impact: Provides a description of the potential social impacts and mitigation.

Chapter 9: Workers and Community Health and Safety: Provides details of worker and community health & safety.

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Chapter 11: Environmental and Social Action Plan: Provides details of the Environmental and Social Action Plan (ESAP).

Chapter 12: Environmental Monitoring Plan: Provides details of the Environmental and Social Management Plan (ESMP).

Chapter 13: Conclusions and Recommendations: Presents the conclusions and recommendations of this study.

List of References

List of Appendixes

Appendix 1: Public Consultation

Appendix 2: Minutes of stakeholders Consultation Meeting

Appendix 3: list of Attendance for Stakeholders Meeting

Appendix 4: Sample Questionnaire

Appendix 5: Water Quality Assessment

Appendix6: Brief Overview of Environmental Legislative Framework

Scope of the Project

The full project cycle covers construction, operation and decommissioning. The construction activities will involve site preparation (clearance of existing vegetation, installation of a site office and stores, fencing the proposed area to avoid intrusion), disposal of excavation and site clearance wastes, construction of access roads to the project site, landscaping together with some earth moving and filling. Other activities include procurement of construction materials and their delivery to the site, in addition to civil, mechanical, electrical, and building works and removal of construction wastes.

Installation works will include civil works of river diversion through construction of cofferdams, concrete works for the weir and diversion canal, overflow weir and sluice gates and valves, four Kaplan Turbines floor and power generation units and power evacuation

through a 3.3km long 132kV transmission line to Webuye132/33KV Substation.

Project Technical Details

The design of the project components has been planned to have simple and cost-effective execution of civil works.

According to the topographical and geological conditions of the project location, the Nzoia II Small Hydropower Project (SHP) is a weir type hydropower station. The main structures are composed of weir, pressured box culvert, powerhouse, substation and transmission line, etc.

The water retaining structure is gravity type, with crest elevation 1459.00m, the maximum height 25m, and length of the crest 135.23m. The overflow weir is at the left river course, with the crest elevation of 1457.05m and length of 30m. The release sluice is at the middle of the river course, with the invert level of 1451.00m and equipped with three 8m×6.5m top immersed strobes. The scouring sluice is set at the right river course, the invert level of opening is set at elevation 1434.00m and equipped with two 4m×4m submerged strobes.

The intake of pressured box culvert is located on the right weir abutment. Each unit is connected with one 61.32m long box culvert.

There are four vertical Kaplan hydroelectric generating units installed in the main powerhouse. The powerhouse is 51.04m long and 14m wide. The ground elevation of the generator floor and turbine floor are 1439.35m and 1433.19m, respectively. The 33kV transformer yard is located on the upstream of the powerhouse with a ground elevation of 1439.20m. The power will be evacuated through a 3.3km long 132kV transmission line to Webuye132/33kV Substation

The weir is a fine aggregate concrete rubble gravity weir. To decrease the flood water level during flood period, the water retaining structure adopts the combination of overflow weir and release sluice. Length of retaining structure is 135.23m, which include left non-overflow section, headrace intake, scouring sluice, open overflow weir section and right non-overflow section from left to right. Intake is located at right abutment.

EIA Conclusion Summary

This EIA Study recommends timely implementation of the project with adherence to the proposed Environmental, Social and Monitoring Plans. The project benefits identified too far outweigh the negative impacts that will be subject to mitigation measures as specified in the action plans that have been prepared. Furthermore, the proponent has carefully considered and applied acceptable local and international standards regulations at all stages of project planning.

The environmental impacts are discussed later in this document whereas the mitigation

measures for the anticipated negative impacts of the project are presented in Chapter 10, Tables 10.1, 10.2, 10.3, 10.4, and 10.5.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

AC: Alternating Current

Ah: Amperehour

AIDs: Acquired Immuno Deficiency Sydrome

CDM: Clean Development Mechanism

CEMP: Construction Environment Management Plan

COVID-19: Corona Virus Disease 2019

CSR: Community Social Responsibility

DC: Direct Current

DCC: Deputy Count Commissioner

DOHSS: Department of Health and Senior Services

EA: Environmental Auditing

EIA: Environmental Impact Assessment

EMCA: Environmental Management and Coordination Act

EMP: Environmental Monitoring Plan

EPFI: Equator Principles Financial Institutions

ESAP: Environmental and Social Action Plan

ESIA's: Environmental and Social Impact Assessments

ESMP: Environmental and Social Management Plan

FIT: Feed–in Tariff

GDP: Gross Domestic Product

GoK: Government of Kenya

HIV: Human Immuno Virus

HPP; Hydropower Plant

HSE: Health, Safety and Environment

ICAO: International Civil Aviation Organisation

IFC: International Finance Corporation

ILO: International Labour Organisation

KV: Kilo Volts

kV: Kilovolt

LCU: Load Control Unit

MCA: Member of County Assembly

MPa: Megga Pascal

MVA: Meggavolt Amperes

MW: Megga Watts

NEAP: National Environmental Action Plan

NEMA: National Environmet ManagementAutority

NTSA: National Transport and Safety Authority

OSHA: Occupational Health and Safety Act

PCC: Public Complaints Committee

PP: Public Participation

PPA: Power Purchase Agreement

PPE: Personal Protective Equipment

PRSP: Poverty Reduction Strategy Paper

RERAC: Renewable Energy Advisory Committee

SGR: Standard Gauge Railway

SHP: Small Hydropower Plant

SHPC: Safety and Health Program Committe

STDs: Sexually Transmitted Diseases

STI: Science, Technology and Innovation

UNFCC: UN Framework Convention on Climate Change

UPS: Uninterruptible Ppower Supply

WHO: World Health Organisation

WIBA: Workers Injury Benefit Act

WRA: Water Resources Authority

INTRODUCTION

1.1. Project Background)

Jiatian (Kenya) Company Limited is proposing to construct a 20 MW Hydropower Project on River Nzoia at about 900 Metres upstream of the Webuye Bridge on Highway A104. The proposed Project is run-of-river through a weir across the river. The Ministry of Energy has approved the proposed Hydropower Project and negotiations are ongoing with other relevant institutions of the Ministry of Energy (The Kenya Electricity and Petroleum Regulatory Authority and the Kenya Power Company) for the finalization of the project negotiations and issuance of Power Purchase Agreement (PPA)

1.2. Justification for the Project

Electricity demand in the country is growing significantly mainly due to the favourable productive investment environment and increasing population of the country. The Country in its development agenda guided by its Blue Print Vision 2030 to transform the country from its present economic status of developing country to the Medium Economy by the year 2030. In this vein, the Big Four Agenda of the current Jubilee Government is meant to achieve this initiative by concentrating and committing more resources towards;

(i) Affordable Housing,

(ii) Universal Health Coverage

(iii) Food Security and Nutrition

(iv) Enhancing Manufacturing.

For the country to achieve this anticipated accelerated development will require adequate and reliable source of energy to drive the Big Four Agenda as well as supply the energy to prime the other sectors which contribute to the social and economic development of the Kenyan people.

Currently, the electricity demand stands at 1600 MW against an effective supply of 1,800 MW under normal hydrological conditions. The generation capacities from various energy sources are; the hydropower generation stands at 52.1 % (818MW) mainly generated from nine large power plants and five smaller ones (less than 10MW). The current geothermal generation is 745 MW mainly generated from Olkaria fields. Others are bagasse (cogeneration) and wind 13.2%, 1.8% and 0.4% respectively while fossil based thermal contributes about 32.5%. The current electricity demand gives a reserve margin of 238 MW (20%). However, during low hydrologic conditions, the hydropower generation is reduced, the reserve margin diminishes significantly necessitating load shedding and procurement of

expensive emergency thermal power.

The peak load demand is projected to grow to about 2,600 – 3600, MW by 2020 and 15,000 MW by 2030. To meet this demand, the projected installed capacity should increase gradually to 19,169 MW by 2030.

The future power sector planning in Kenya is based on a 10-year power development program from 2014 – 2024 that places emphasis on the load forecasting, power generation and transmission planning. The program is intended to incorporate renewable energy into the power generation, especially focusing on the projects that conform to Feed –in Tariff (FIT). Demand forecasts estimate that by 2024 there will be supply insufficiency of 10,000 MW in the "Vision 2030" economic blueprint of 2030.

In the energy sector policy of 2004, the installed capacity of a run-of-river hydropower plant less than 10 MW was defined as a Small Hydropower Plant (SHP), further subdivided into small, mini (up to 1MW) and micro (up to 0.1 MW).

The SHP system is a proven renewable energy technology. The SHPs are particularly suitable energy generation in rural areas. SHP are advantageous because of short implementation times, low initial financial investments cost, low environmental negative impacts especially if the power generation is by run-of-river flow without construction of water storage reservoirs which have significant environmental negative impacts. The project affected persons are minimal and the need for human resettlement is minimized or can be entirely avoided. Besides the projects can be implemented in far flung rural areas where land availability is usual of least concern. Where communities live far away from the conventional power grid, SHP can come in handy where communities can be supplied with power from such SHP where ling transmission lines can be avoided. The run-of-river SHPs main components is a weir, diversion works for the water, delivery pipes/channels (penstock) and power house containing turbines and generator. The hydropower potential in Kenya is estimated to be around 6000MW and of this SHP contributes about 3000MW. Despite the existence of this high potential of SHP only a paltry 30MW has been installed. Translating to only 1 % of the SHP potential exploited. In Kenya field investigations have over 50 river sites with potential for development of SHP. Most of the sites with potential SHP development are located in areas that are primarily suitable for standalone power generation systems, for off-grid supply of power to local communities and commercial enterprises in the far flung communities in rural areas. The sites that have potential for SHP development in Kenya are situated in the five river basins: Lake Victoria Basin, Rift Valley, Athi River, Tana River and Ewaso Ng'iro River basin. These areas have high development potential and

therefore ideal for SHP development. In the Central region there are streams and rivers many of them having natural falls site which are ideal for SHP development. The challenges that impede SHP development include lack of technical know-how of SHP and the potential sites for such, lack of funds by communities or private investors and drought experienced in many parts of Kenya impede interest in SHP development.

To attract investment from the private sector, the Government of Kenya commissioned a natural resource assessment on SHP and feasibility studies on potential sites. Despite this, the Government is still striving to promote the development of SHP sector, so that there are 35 sites with a total installed capacity of 163.7 MW in different stages of implementation (i.e., licensed, construction or negotiation process).

The Kenya Government is keen to increase the proportion of renewable energy in the country's energy mix, which can be proved by its relatively friendly policies, such as the scope of renewable energy supplement application, tax exemption for renewable energy equipment, and public investment increased in geothermal exploration. All these policies are aimed at attract the investment from private sector.

The 10-year industry expansion plan is intended to incorporate renewable energy into the country's power sector planning process, focusing on renewable energy projects approved in the appropriate process. The plan gives important recognition to the renewable energy as a drive of country's power supply, and proposes the establishment of an interdepartmental renewable energy advisory committee (RERAC) to advise the government on the issues such as water tower and watershed management, etc.

1.3. The Project Objective

Webuye is an industrial hub in western Kenya, where the paper and sugar industries occupy an important position in the country. However, western Kenya has the lowest level of electrification development in the whole country and is also the largest area with the power supply gap.

The development of Nzoia II Hydropower Plant (HPP) is very important as it is suitable to meet out the power demand of nearby villages and towns of Webuye district to provide general amenities and propriety to the local inhabitants as well as to boost up industrial and agricultural development. The development of this project shall contribute to:

i. Meet the power demand of Webuye district and avoid long-distance power transmission
ii. Electrification of un-electrified villages of Kakamega and Bungoma counties
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The development of Nzoia II HPP is quite favourable of nearby area due to availability of proven technology, short gestation period of project, cheap and simple operation, no escalation in cost of production, long service life and no bad impact on environment. This would not only improve the socio=economic conditions but also help in preserving and developing a well-balanced eco-environment.

1.4. Project Location

Nzoia II Hydropower Plant Project (HPP) is located in the suburbs of Webuye town, on Nzoia River which is also border line between Kagamega and Bungoma County. The weir site location coordinates are Longitude: 34˚48’39.9” E and Latitude: 0˚35’07.7” N, approximately 5km from Webuye down town, 380km from Nairobi, 861km from Mombasa harbor. The famous Webuye Waterfall is 2km upstream of this site. Figures 1 and 2 show the Project Location and the Nzoia II Small Hydropower Plant site.

Figure 1.1: Project Location

Figure 1.2: Proposed Nzoia II small hydropower plant location

1.5. The EIA Study Objectives

The objectives of the Environmental Impact Assessment (EIA) follow those of a full EIA study ensuring compliance with requirements outlined by NEMA.

The EIA objectives include:

1. Conducting an EIA to identify both positive and negative impacts of the proposed project and propose the most appropriate mitigation measures during the construction, operation and decommissioning phases of the project.
2. Collecting baseline socio-economic data of the project area and the potential impacts expected from project construction, implementation, operation and decommissioning.
3. Developing an Environmental Monitoring Program during the construction and operation phase and present plans to minimize, mitigate or eliminate any negative effects and impacts identified.
4. Describing the Environmental Management Plan implementation mechanisms; review the power plant design and its compliance with environmental requirements.
5. Identifying the project stakeholders to seek their views on the proposed project.
6. Facilitating public open meetings for the stakeholders to air their views.
7. Compiling draft EIA report.

8. Compiling the final EIA report.
9. Submission of the final EIA report to NEMA and subsequent follow up to obtain relevant authorization/permit in order that the project can commence.

1.6. Structure of the EIA report

This EIA report is presented in 13Chapters and 6Appendices. The objective of the EIA report is to provide a synthesis of the knowledge regarding the proposed project, the current environment and social conditions in the project area, potential impacts associated with the project, mitigation measures to address identified impacts and an Environmental Management Plan to mitigate the negative impacts arising from the project implementation.

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List of References

List of Appendixes

PROJECT DESCRIPTION

2.1. Brief Description of Nzoia River

The Nzoia River, which has a length of about 335 km, runs through the Nzoia sub-basin, with a catchment area of about 12903 km2, its mean discharge is about 118 m3/s. The Nzoia River originates in southern part of Mt. Elgon and Western slopes of Cherangany. The river flows approximately South-West eventually flowing into Lake Victoria near the town of Port Victoria. The population within the Basin is more than 3 million comprising of Bantu and Nilotes peoples.

In its upper reaches from 135 km to 257 km in the highlands, the river flows in a slightly meandering V shaped valley. The width of the channel is about 40m and bed gradient 1 in 240. There are a few human settlements on the valley bottom with uncontrolled cattle grazing in the watershed areas.

In the middle reaches from 20 km to 135 km, the river meanders over a narrow valley floor a channel width of 50 m and bed slope of 1 in 390. The area has more human settlements on the valley bottom with increased human activity, mainly in the nature of subsistence agriculture and livestock farming.

In the last 20 km reach up to its outfall into the lake, the bed slope flattens to 1 in 3400 as the river meanders through a wide flood plain and the Yala Swamp. The channel width increases to 70m and the height of the banks reduces considerably, which causes spilling of floodwaters over the banks and consequent flooding of large areas on either side. The density of human settlements is pronounced with considerable economic activity in the form of agriculture and livestock farming. It is in this last 20 km that the river gathers strength as it flows downstream to an extent of bursting as it reaches the Budalangi areas. The floods depend on the intensities of rainfall in the upstream regions Elgon, Cherangany and the surrounding areas.

In addition to a primitive forest in the origin of the river, most area of the basin upstream of the weir site is covered with gently sloping hills and the valley is flat. The basin also collects streams from Mount Elgon and Cherangany, very suitable for agriculture and farming. The basin is sparsely populated. The population lives in Eldoret mainly, and agriculture and plant growing are their dominant sector, and soil erosion is getting worse. The eastern tributary (from Cherangany) has very high contents of sediments. The river is muddy in rainy seasons while the northern tributary has better water quality.

The general situation of water system in Nzoia River basin is shown in Figure 2-1.

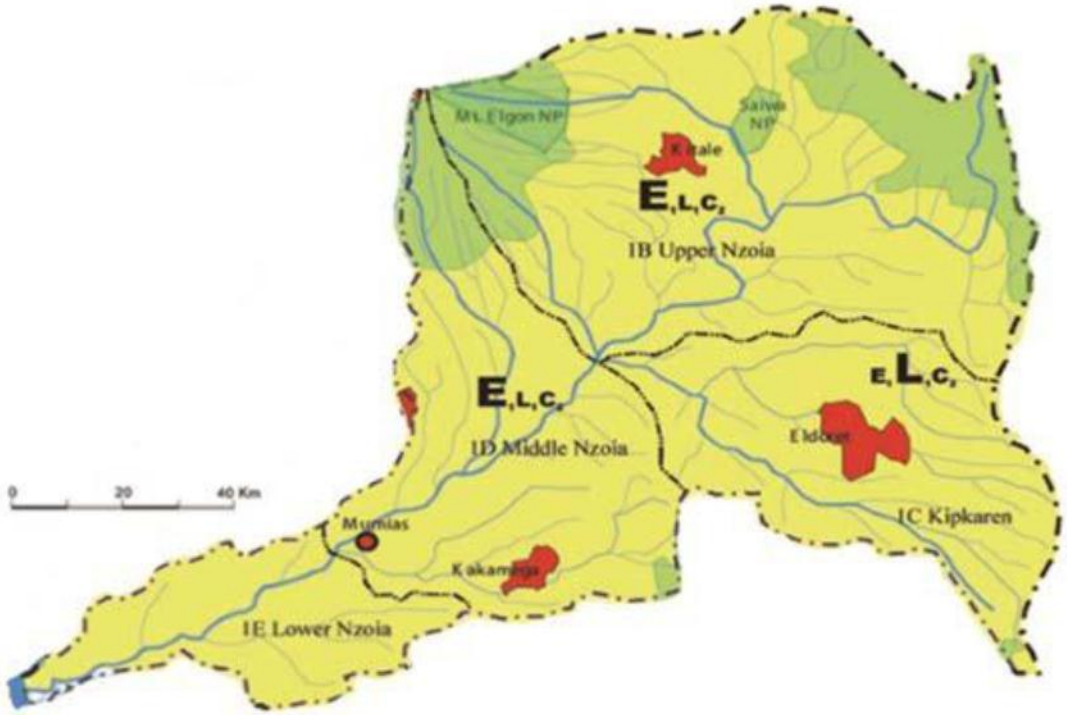

Figure 2.1: Nzoia River Basin Map

The two high-ground areas of Mt. Elgon and Cherengany Hills, where Nzoia River originates from, are known to have high rainfall amounts almost throughout the year. They receive average annual rainfall amounts of 1,500 ~1750mm while Budalangi area receives an average of about 1,100mm.

In conclusion, the mean annual rainfall of the basin upstream of Nzoia II HPP is 1300mm. According to analysis of data provided by the meteorological station, compared with the raining pattern of Nairobi region, the double peak feature of the annual raining pattern is not distinct in this basin. The wet season starts from April to September and only in June there is a bit less precipitation, which is also close to the average rainfall.

2.2. Basic Hydrologic Data

There are five gauge-stations on the Nzoia River, four of them distributed on the tributary. The gauge station code 1DA02 is located 400m downstream of Nzoia II HPP weir site, which is the one and only gauge station on trunk stream of Nzoia River. Gauge station 1DA02 was set up in 1947, and is still in use nowadays, whose catchment area is 8465.4 km2, with the only observation item of water level.

Gauge Station 1DA02 has the daily average flow data from1947 to 2015, but the daily measuring absence is frequent, varying from consecutive days to consecutive months. After technical manipulation, only 54 years' data is available. The broken data of inadequate monthly records of 1950, 1996, 1997, 1998, 1999, 2000, 2005, 2007 and 2009 cannot be

used.

According to statistics of the 58-year daily flow records, average annual discharge of the gauge station 1DA02 is only 51.6m3/s, which does not proportionally match to its basin area. The area of 1DA02 accounts for 65.6% of the entire basin, and its rainfall is the highest in the basin, while only average annual discharge accounts only 38.4% of the whole basin, which is very unreasonable. After field investigation at 1DA02, sand mining activities near the station were found, the measured section was unstable, leading to obvious lower results compared with relevant information. Recorded runoff series of gauge station 1DA02 needs to be rectified.

According to the local water supply project report, an average 95% run off rate of 10 l/s/km2 for the upstream catchment area, this gives an average river discharge of 6,912,000 m3/d at the Webuye town, it's nearly 80 m3/s annual average discharge. The gauging station 1DA02 is located in the downstream of Webuye town, the annual average discharge must be more than 80 m3/s

Since the basin area of gauge station 1DA02 accounts for 65.6% of the total area of Nzoia River basin, regardless of rainfall difference, the annual average discharge will be 77.41m3/s. In fact, the rainfall upstream of 1DA02 is over 10% more than that of the total basin area. After revision, the annual average flow data of 1DA02 would be 85.17m3/s. With ratio of 85.17 over 51.6, the recorded average daily discharge at 1DA02 from the year 1948 to 2014 is rectified, and runoff series of gauge station 1DA02 is obtained with the average total annual runoff 2,686.14 M m^3, annual average flow is 85.17m^3/s.

2.3. Engineering Geologic Conditions of Reservoir Area

The proposed weir site of Nzoia II HPP is just located in the upstream of a small waterfall. The famous Webuye Waterfall is 2km upstream of the proposed weir site. Normal water level of the reservoir is 1457.00m, and the length of backwater is about 2km extending to Webuye Waterfall.

The topography of reservoir area is a canyon section formed by the cutting of the Nzoia River on the platform, the platform is 50~70m above the riverbed. The banks are steeper and the slope is more than 35°.

The watercourse in the reservoir area is 30~50m in width, gentle and deep. The gneiss can be seen at the riverbed of weir site, and the flow became turbulent. The river bank is stable. The platform on both sides of the reservoir is wide and thick, and no large faults cross the reservoir area, and no-fault structures leading to adjacent valleys are found, the terrain is closed in a good condition. So, there is no permanent leakage problem with the reservoir.

2.4. Engineering Geology of Weir Site

Nzoia River turned about 175° to the right at the weir site and formed a series of small waterfalls. The weir axis is located in the middle of the big bend, which is also the top of a waterfall, with a drop of about 2m. Water depth and river width at the weir site are respectively 1~3m and 31~30m, where the turbulent stream crashes its way through the waterfall. The main stream is on the right channel.

The exposed rock at the weir site area is mainly spheroidal weathered granitic gneiss, and it is estimated that the thickness of strong weathered layer is 0.3-1m. Local accumulation at the surface of both banks is high liquid limit clay with thickness of 0.5—2m.

Figure 2.2: Topography of Reservoir Area

The exposed rock at the riverbed is mainly granitic gneiss. Engineering geological condition of riverbed is stable since the lower base rock is strong and integral. The weir foundation seepage is not serious, which can be classified as weak permeable by permeability level. Medium and low weir is advised according to topographic condition of weir site.

Figure 2.3: Exposed Rock at Weir Site

2.5. Engineering Geology of Plant Area

The plant site is 55m downstream of the weir site on the right bank of Nzoia River, downstream of a small waterfall, at the outlet of the canyon section of the river, the ground elevation is 1436~1449m. The river flows through the weir site from north east to south west, and turn to north west after past the plant site. The terrain of the plant area is gentle. The river width is 50~57m, and water depth is 2~3m.

The overburden of the plant site is 1 ~ 5m thick, being gravel diluvium. The powerhouse will be built on granitic gneiss foundation that is stable and of high strength with large loading capacity, and good engineering geological conditions. It can meet the design requirements for the foundation.

Due to the low foundation elevation of powerhouse, flood control and drainage measures should be taken during the foundation excavation.

2.6. Natural Building Materials

According to initial investigation, the project area is short of aggregates, but rich in clay,

Nzoia II HPP is a Run of River hydropower station. The main civil works of the project include the weir, headrace culvert, powerhouse and substation, etc. The weir is gravity type, with crest elevation of 1459.00m, maximum height 25m, and length of the crest 135.23m. The weir is equipped with release sluice and overflow weir. The overflow weir is at the left river course, with the crest elevation of 1457.05m and net length of 30m. The release sluice is at the main river course, with the bottom elevation 1451.00m and equipped with three

8m×6.5m top immersed strobes. The powerhouse will be set up at the right bank about 59.5m downstream of the weir. There will be four vertical Kaplan hydroelectric generating units installed in the main powerhouse. The capacity of each unit is 5 MW, with a rated head of 22.20m, rated discharge of 25.7m3/s. The power will be evacuated through a 3.3km long 33kV transmission line connect to Webuye 132/33kV substation of national grid.

2.7. Description of General Layout

2.7.1. Selection of Weir and Powerhouse Site

The river bed slope downstream of the powerhouse site of Nzoia II HPP is small, and the water is deep. Only at the big bend of 1.8km does the small waterfall and bedrock. Upstream reaches of the big bend are a canyon landform, and both banks of the downstream suddenly open and low platform appear. There is farmland, farmhouses on the downstream platform. The big bend is the best choice for weir site, no matter in topography or geology.

Nzoia River turned about 175° to the right at the weir site and formed a series of small waterfalls. The weir axis is located in the middle of the big bend, which is also the top of a waterfall, with a drop of about 2m. Water depth and river width at the weir site are respectively 1~3m and 31~30m, where the turbulent stream crashes its way through the waterfall. The main stream is on the right channel. The weir site is about 2 km downstream of Webuye Waterfall.

The river bed slope downstream of the weir site is small, and the topography is low and gentle on both banks. The powerhouse site is available on the right bank 59.5m downstream of the weir axis.

Figure 2.4: Weir and Powerhouse Site

2.7.2. Selection of Weir Type

According to geological and topographic conditions, the weir site is located in the outlet of a canyon section. The mountains of both banks at weir site are higher, the topography is basically symmetrical, riverbed and the lower slope is bedrock exposed. The elevation of river bed is about 1434.5m. The channel width is 20~23m, and the water lever is 1436.00m during dry season. The overburden of upper slopes at both banks is thin.

Because the flood peak is large and the riverbed at the weir site is relatively wide and the weir is not high, gravity overflow weir will be recommended. To decrease the flood water level in flood period, the water retaining structure adopts the combination of open overflow weir and gates controlled release sluice

2.7.3. General Layout

The main objective of the Nzoia II HPP is to generate power economical and expeditiously, utilizing the local available material and labor to the extent possible. The design of the project components has been planned to have simple and cost effective execution of civil works.

According to the topographical and geological conditions of the project location, the Nzoia II HPP is a weir type hydropower station. The main structures are composed of weir, pressured box culvert, powerhouse, substation and transmission line, etc.

EIA METHODOLOGY

3.1. Brief Description of Methodology

3.1.1. EIA Study Approach

Based on the detailed review provided by the Project Proponent, the following approach and methodology for achieving the study objectives were adopted:

Close consultations with the Client - The Project Proponent provided all relevant information regarding the proposed project design.

- In depth review of background reports and the project's Feasibility Study Report.
- Consultation with the key stakeholders, including opinion leaders, community leaders and government officials. The specific stakeholders were identified by an in-depth stakeholders' analysis exercise.
- The experience of the project team in similar projects.
- Application of versatile, practical and economic measures and options.
- Collection, analysis and application of primary and secondary data. Baseline data on soil, water, vegetation and noise studies.
- Assessment of impacts and development of mitigation measures.

The study was conducted in accordance with the Environmental Assessment and Audit Regulations promulgated in 2003 (2012) as set out by the Environmental and Management and Coordination Act (EMCA, 1999) and (Amendment Act 2015). A comprehensive participatory process was adopted to ensure active participation of members of the public to inform them of the government proposal and consequently have them air their views on the project. Members of public were also involved since they will be affected by the construction of the project either positively or negatively. All relevant stakeholders were consulted through formal and informal interviews and through discussions.

3.1.2. The EIA Process

The methodology developed and adopted for this assessment provides a tool for assessing and evaluating the significance of effects. An outline of this methodology is provided below.

(a) Establishment of Baseline Conditions

The environmental and social impacts assessment and prediction is based on the pre- existing baseline conditions. These baseline conditions were established through:

- Detailed consultations with the affected communities and institutions;
- Assessment of the general site conditions in topography, land use, vegetation, etc.
- Site surveys;

- Focus group discussions with affected communities; and
- Information gathered using questionnaires administered to key stakeholders such as project area community, the local administration (chief, assistant chief, Member of County Assembly (MCA), Deputy Count Commissioner (DCC), community elders, the Nyumba Kumi membership, community leaders.
- A survey of the baseline conditions was carried out covering social economic analysis of the project vicinity and physical inspections and observations.

(b) Environmental Impact Assessment

The scope of the assessment covers the preconstruction phase, construction works of the proposed development (which includes ground preparation, civil works, structural works, construction of the weir and water diversion works, installation of turbines and the necessary electrical infrastructure as well as the utilities required in the power house, operational and decommissioning phases of the hydropower plant. The output of this work is a comprehensive EIA Project Report for the purposes of seeking a NEMA license that will approve the project construction and operation. Additionally, the report aims to meet the Equator Principles Financial Institutions (EPFI) requirements. These are requisite for projects seeking funding from international funding agencies such the World Bank, International Finance Corporation, etc.

(c) Development of the EIA Study Report

The compilation of the EIA report entailed the following:

- Review of literature on baseline environment and engineering design documents.
- Information from the public consultations.
- Compilation of findings to ensure all issues are covered.
- Assessment and evaluation of the likely impacts.
- Development of environmental mitigation measures for the adverse impacts.
- Compilation of full EIA study report for the project

(d) Defining Impact Significance

A project with the magnitude of the proposed Small Hydropower Plant is expected to have environmental impacts on certain aspects of biophysical and socio-economic environment of the project area both during construction, operation stages and decommissioning.

The impacts of the project were assessed and are generally grouped into those affecting soil, water resources, air quality, flora and fauna, community and their economic activities, vegetation, aesthetics and landscape, noise and human health during construction. Appropriate mitigation measures are also discussed in detail. These impacts were considered

for the various phases of the project that is during construction, operation and decommissioning of the facilities. It should be noted that for hydropower the majority of impacts occur during construction and are temporary. However, some impacts occur during operation. Decommissioning impacts are broadly similar with those of the construction phase.

The negative impacts can be direct or indirect. The magnitude of each impact is described in terms of being significant, minor or negligible, temporary or permanent, long term or short term. Generally, temporary impacts having no obvious long-term consequences are regarded as minor.

APPLICABLE REGULATION AND STANDARDS

4.1. Kenya regulations

4.1.1. Introduction

Kenya's main environmental policy emanates from various international and local policy documents including the Bruntland Commission, the Rio Declaration, Kenya's, Vision 2030 and the Sessional Paper No. 6 of 1999 on Environment and Development, among others. The Constitution of Kenya, 2010 and the Environmental Management and Coordination Act (EMCA) of 1999 govern environmental management in Kenya (Amendment Act of 2015). The Environmental Management and Coordination Act (EMCA) of 1999 establishes the National Environment Management Authority (NEMA) the statutory body responsible for ensuring that Environmental Impact Assessments (EIA) are carried out for new projects and environmental audits on existing facilities as per the Act 1999. Projects subject to this requirement are specified in the Second Schedule of the EMCA, 1999.

Environmental and Social Impact Assessments (ESIA's) are carried out in order to identify potential positive and negative impacts associated with the proposed project with a view to maximize the positive impacts and minimize by developing mitigation measures for the negative ones. The ESIA also ensures that baseline data for the proposed project is collected. This is then used for monitoring and evaluating the impacts during the project cycle. It is a requirement by both NEMA and IFC that a clear management plan and action plan that describes and prioritizes the actions needed to implement mitigation measures is developed. In this Chapter, a review of regulations that guide an ESIA on small hydropower power projects will be made. Environmental Auditing (EA) is a tool for environmental conservation and has been identified as a key requirement for existing facilities to ensure sustainable operations with respect to environmental resources and socio-economic activities in the neighborhood community of the facilities. The government has established regulations to facilitate the process on EIAs and EAs. The regulations are contained in Kenya Gazette Supplement No. 56, legislative, Supplement No.31, Legal Notice No.101 of 13th June 2003 and Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2009 (2012).

4.1.2. Kenya's Vision 2030

This is a national long-term development blueprint to create a globally competitive and prosperous nation with a high quality of life by 2030. It aims to transform Kenya into a newly industrialized, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. The vision is anchored on three key pillars;

economic, social and political governance.

The Economic Pillar of Vision 2030 seeks to improve the prosperity of all regions of the country and all Kenyans by achieving a 10% Gross Domestic Product (GDP) growth rate by 2012. Within the Medium-Term Plan 2017-2022, four targeted priority sectors that make up the larger part of Kenya's GDP (57%) and provide for nearly half of the country's total formal employment include:

i. Affordable Housing,
ii. Universal Health Coverage
iii. Food Security and Nutrition; and,
iv. Enhancing Manufacturing.

The objective of the Social Pillar is investing in the people of Kenya in order to improve the quality of life for all Kenyans by targeting a cross-section of human and social welfare projects and programmes, specifically:

- Education and training
- Health
- Environment
- Housing and urbanization
- Gender, children and social development
- Youth and sports

The Political Pillar aims at moving to the future as one nation and envisions a democratic system that is issue based, people centered, results oriented and is accountable to the public. The pillar is anchored on transformation of Kenya's political governance across five strategic areas; The rule of law – the Kenya Constitution 2010 Electoral and political processes democracy and public service delivery, Transparency and accountability security, peace building and conflict management.

The economic, social and political pillars of Kenya Vision 2030 are anchored on;

- Macro-economic stability
- Continuity in governance reforms
- Enhanced equity and wealth creation opportunities for the poor
- Infrastructure
- Energy
- Science, Technology and Innovation (STI)
- Land reform
- Human resources development

- Security
- Public sector reforms

Commercial energy in Kenya is dominated by petroleum and electricity as the prime movers of the modern sector, while wood fuel provides energy needs of the traditional sector, including rural communities.

The Government is committed to continued institutional reforms in the energy sector including encouraging more private generators of power. It is expected that new sources of energy will be found through exploitation of geothermal power, coal and other renewable energy sources, and more emphasis on green energy technologies such wind and solar. In this regard small hydropower development has gained special attention by the government though creation of enabling environment for investment though feed-in-tariff policy.

4.1.3. Sessional Paper No. 6 of 1999 on Environment and Development

Every person in Kenya is entitled to a clean and healthy environment and has a duty to safeguard and enhance the environment. As envisioned in Sessional Paper No. 6 of 1999 on Environment and Development, Kenya should strive to move along the path of sustainable development to meet the needs of the current generation without compromising the ability of the resource base to meet those of future generations. The overall goal is hence to integrate environmental concerns into the national planning and management processes and provide guidelines for environmentally sustainable development. The policy paper emphasizes environmental the developer as an integral part of a project preparation must undertake impact assessment. It also proposed for periodic environmental auditing to investigate if developer is fully mitigating the impacts identified in the assessment report

4.1.4. The National Environmental Action Plan (NEAP

The NEAP for Kenya was prepared in 1994. It was a deliberate policy to integrate environmental considerations into the country's social and economic development process. The integration was achieved through multi-sector approach and a comprehensive framework to ensure that environmental management and conservation of natural resources is an integral part of societal decision-making process.

4.1.5. The Poverty Reduction Strategy Paper (PRSP)

The PRSP has the twin objectives of poverty reduction and economic growth. The paper articulates Kenya's commitment and approach to fighting poverty, with the basic rationale that the war against poverty cannot be won without the participation of the poor themselves. The proposed project, during and after implementation, will offer jobs to many Kenyans as a way of contributing to this noble objective of reducing poverty

4.2. Legislative and Regulatory Framework

The Table 4.1 provides a summary of the relevant environmental legislation and regulations currently enacted in Kenya. A more detailed description of these pieces of legislation is provided in Appendix 6.

Table 4.1: Legislation Summary

Legislation	Description
The Constitution of Kenya, 2010	Article 32 of the Constitution of Kenya states that "Every person has the right to a clean and healthy environment". Environmental obligations are stated in Article 69
Environment Management and Co-ordination Act 1999	This Act governs EIA studies in Kenya and requires that EIAs for power generating projects are carried out as per the second schedule of the Act. The Act also set-ups the NEMA.
Environment Impact Assessment and Audit Regulations, 2003	Under this Act submission of environmental reports became mandatory, and no proponent shall implement a project likely to have a negative environmental impact or one for which an EIA has been concluded and approved in accordance with these regulations
EMCA (Noise and Excessive Vibration Pollution Control), 2009	These regulations prohibit excessive noise and vibration
Waste Management Regulations, 2006 (Legal Notice No.121)	These regulations are meant to streamline the handling, transportation and disposal of various types of waste in order to protect human health and the environment.
EMCA (Wetlands, River, Lake and Sea) Regulations, 2009	This Act provides for the conservation and sustainable use of all wetlands and their resources whether occurring in private or public land in Kenya. It ensures the

	conservation of water catchments and the control of floods and the sustainable use of wetlands for ecological and aesthetic purposes. Furthermore, the Act makes provision for the protection of wetlands as habitats for species of fauna and flora and provision of a framework for public participation in the management of wetlands. The Act does not permit any person to engage in any activity that may have an adverse impact on any ecosystem; may lead to the introduction of any exotic species or to unsustainable use of natural resources, without an Environmental Impact Assessment License issued by the Authority under the Act.
Waste Management Regulations, 2006 (Legal Notice No.121)	These regulations are meant to streamline the handling, transportation and disposal of various types of waste in order to protect human health and the environment.
EMCA (Wetlands, River, Lake and Sea) Regulations, 2009	This Act provides for the conservation and sustainable use of all wetlands and their resources whether occurring in private or public land in Kenya. It ensures the conservation of water catchments and the control of floods and the sustainable use of wetlands for ecological and aesthetic purposes. Furthermore, the Act makes provision for the protection of wetlands as habitats for species of fauna and flora and provision of a framework for public participation in the management of wetlands. The Act does not permit any person to

	engage in any activity that may have an adverse impact on any ecosystem; may lead to the introduction of any exotic species or to unsustainable use of natural resources, without an Environmental Impact Assessment License issued by the Authority under the Act.
Physical Planning Act (No. 13 of 2019	These regulations are meant to streamline the handling, transportation and disposal of various types of waste in order to protect human health and the environment. This Act provides for the conservation and sustainable use of all wetlands and their resources whether occurring in private or public land in Kenya. It ensures the conservation of water catchments and the control of floods and the sustainable use of wetlands for ecological and aesthetic purposes. Furthermore, the Act makes provision for the protection of wetlands as habitats for species of fauna and flora and provision of a framework for public participation in the management of wetlands. The Act does not permit any person to engage in any activity that may have an adverse impact on any ecosystem; may lead to the introduction of any exotic species or to unsustainable use of natural resources, without an Environmental Impact Assessment License issued by the Authority under the Act. This Act provides for the preparation and implementation of physical development

	plans and for connected purposes. Section 36 of this Act provides for EIAs.
The Forest Act 2005	This Act provides for the establishment, development and sustainable management, including conservation and rational utilization of forest resources for the socio - economic development of the country
The Water Act of 2002	This Act provides for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services; to repeal the Water Act (Chapter. 372 of the Laws of Kenya) and certain provisions of the Local Government Act; and for related purposes.
The Energy Act	Section 27 of this Act provides that subject to the provisions of this Act, a license or licenses as the case may be, shall be required for the generation, importation or exportation, transmission or distribution of electrical energy; or supply of electrical energy to consumers
Electric Power Act (Act No. 11 of 1997) Kenya Electricity Grid Code & Kenya Safety Code	This Act amends and consolidates the law relating to the generation, transmission, transformation, distribution, supply and use of electrical energy for lighting and other purposes, and for connected purposes. The provisions of this Act apply to every public or local authority company, person or body of persons generating,' transmitting, distributing, supplying, or using electrical energy, and to all works or apparatus for any

	or all of these purposes. The Kenya Electricity Grid Code sets out detailed arrangements for the regulation of the Kenyan electricity supply industry and is enforceable under the Electric Power Act (No. 11 of 1997)
Occupational Safety and Health Act2007(CAP 15)	This Act secures the safety, health and welfare of persons at work; and protects persons other than persons at work against risks to safety and health arising out of, or in connection with the activities of persons at work
The Public Health Act (Chapter 242 of the Laws of Kenya)	This Act of Parliament makes provisions for securing and maintaining health. There are provisions within the Act to deal, in a general way, with water, air and noise quality as they pertain to human health. An environmental nuisance is defined and includes the emission from premises of wastewaters, gases and smoke which could be regarded as injurious to health
Agriculture Act (Chapter 318 of the Laws of Kenya)	Act seeks to promote and maintain a stable agriculture, to provide for the conservation of the soil and its fertility and to stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry
Wildlife (Conservation and Management) Cap 376 Laws of Kenya	This Act provides that where it is desirable that the present powers relating to the management and conservation of wildlife in Kenya should be amalgamated and placed in a consolidated Service of the Government
Land (Group Representatives) Cap 287 of	This Act provides for the incorporation of

the Laws of Kenya	representatives of groups who have been recorded as owners of land under the Land Adjudication Act.
Way leaves Act (Chapter 292 of the Laws of Kenya)	This Act provides that any person in the service of the government and any contractor executing any work for the Government, together with his agents and servants, may at any time enter upon any land for the purpose of surveying, setting out and marking the line of any intended sewer, drain or pipeline, or for the purpose of inspecting, repairing, removing, re-laying or cleansing any sewer, drain or pipeline the property of the Government, or for any other purpose under this Act
Land Acquisition Act (Chapter 295 of the Laws of Kenya.)	This Act makes provisions for the compulsory acquisition of land for the public benefit
Local Government Act (Chapter 265 of the Laws of Kenya)	This Act provides for the establishment of authorities for local government; to define their functions and to provide for matters connected therewith and incidental thereto. The Act is connected with a wide range of matters that affect the day-to- day activities of individuals and organizations.
The Trust Land Act (Chapter 288)	This is an Act of Parliament which makes provision for Trustland.
The Valuers Act Cap 532	The revised edition 1985 of the valuers act cap 532 makes provisions for the relevant charges and conducts of valuers in relation to valuation of assets. This act help protect those people affected by the proposed pipeline by providing the relevant

	regulations and guidelines in the undertaking land valuation.
The Penal Code (Cap. 63)	The chapter on "Offences Against Health and Conveniences"contained in the Penal Code enacted in 1930 strictly prohibits the release of foul air into the environment, which affects the health of other persons
The Radiation Protection Act (revised 1985)	The act makes provisions for the manufacture or otherwise produces or possess or use or either sell, dispose of or lease, loan or deal with or import or cause to be imported; or any irradiating device or radioactive material except under and in accordance with a licence issued under this Act
The Limitation of Actions Act Cap 22	An Act of Parliament to prescribe periods for the limitation for actions and arbitrations, and to make provision concerning the acquisition of easements by prescription, and for matters incidental thereto and matters connected therewith
The Employment Act, 2007	An Act of Parliament to repeal the Employment Act, declare and define the fundamental rights of employees, to provide basic conditions of employment of employees, to regulate employment of children, and to provide for matters connected with the foregoing.
The Lake and Rivers Act Cap 409	The Act makes provision for regulating the use of lake or river for the transport of floating timber; regulating the traffic on a lake or river; for protecting the bird or animal life on or in a lake or river

4.3. International Conventions

Kenya is a signatory to various international legislation, conventions and treaties that have a bearing on the environment. Some of these that are applicable on wind power generation projects include:

4.3.1. World Commission on Environment and Development

The Commission commonly referred to as "the Bruntland Commission "focused on the environmental aspects of development, in particular, the emphasis on sustainable development that produces no lasting damage to biosphere, and to particular ecosystems. In addition, environmental sustainability is the economic and social sustainability. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resources. While social sustainable development maintains the cohesion of a society and its ability to help its members work together to achieve common goals, while at the same time meeting individual needs for health and well-being, adequate nutrition, and shelter, cultural expression and political involvement.

4.3.2. The Rio Declaration

Agenda 21 – a programme of action for sustainable development worldwide, the Rio Declaration on Environment and Development was adopted by more than 178 governments at the United Nations Conference on Environment and Development, known as the Earth Summit, held in Rio de Janeiro, Brazil from 3rd to 14th June 1992.

On sustainable and responsible development, Principle 3 states, "the right to development must be fulfilled so as to equitably meet development and environmental needs of present and future generations."

While Principle 10 states that: "Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. Principle No. 10 of the declaration underscore that environmental issues are best handled with participation of all concerned citizens at all the relevant levels.

At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided."

The foregoing discussion is relevant to the proposed development because EMCA demands

that public must be involved before a proponent initiates any development project that is likely to have adverse impacts to the environment. The Act has further established Public Complaints Committee (PCC) where the issues raised by the public in regard to any proposed development can be addressed.

4.3.3. UN Framework Convention on Climate Change (UNFCC) (1992)

This international framework requires that all parties "stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Within a timeframe" that is "sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner". The Nzoia II Small Hydropower Project is a green energy plant and it will be contributing significantly in the reduction of greenhouse gases in line with the tenets of the UNFCC.

4.3.4. Kyoto Protocol (1997 and 2004)

The protocol generally promotes the use of renewable energy through the requirement in Article 2 of the protocol that:

Each party included in Annex shall:

i. Research on, promote, develop and increase use of new and renewable forms of energy, of carbon sequestration technologies and of advanced and innovative environmentally sound technologies".

ii. Demonstrate the "progressive reduction or phasing out of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all greenhouse gas emitting sectors that run counter to the objective of the protocol and apply market instruments"

iii. Article 10 (c) requires that all parties "cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of or access to environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries, including the formulation of policies and programs for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector to promote and enhance the transfer of and access to environmentally sound technologies."

4.3.5. Clean Development Mechanism

The Nzoia II hydropower Project is a potential Clean Development Mechanism (CDM) project. The CDM was established under Article 12 of the Kyoto Protocol adopted by the

Third Conference of the Parties to the Framework Convention on Climate Change on December 11, 1997.

4.3.6. Convention on Biological Diversity (1992)

Principle No. 10 of the declaration states that environmental issues are best handled with participation of all concerned citizens at all relevant levels. At the national level, each individual shall have appropriate access to information that is concerning environment that is held by public authorities. States shall encourage and facilitate public participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy shall be provided.

The foregoing discussion/forums is relevant to the proposed development because EMCA demands that public must be involved before any development project that is likely to have adverse impacts to the environment is initiated by a proponent. The Act has further established Public Complaints Committee (PCC) where the issues raised by the public in regard to any proposed development can be addressed. Nonetheless the Nzoia II Hydropower Project is a run-of-river project and such projects low adverse both social and environmental impacts.

4.3.7. Montreal Protocol, 1987

This treaty was meant to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion. The Nzoia II Hydropower project process has no emissions that would affect the ozone layer.

4.3.8. United Nations Convention to combat Desertification (1994)

An agreement to combat desertification and mitigate the effects of drought through national action programs that incorporate long term strategies supported by international cooperation and partnership arrangements. The Proponent of Small Hydropower Project will combat any land degradation through mechanisms which will involve planting of trees to enhance vegetation cover.

4.3.9. Bamako Convention (1991)

The Bamako Convention is a treaty of African nations prohibiting the import of any hazardous (including radioactive) waste. The materials used in the construction of the power project is not hazardous as they comprise tunnels, turbines, sub-stations and transformers and electric power transmission lines, among others.

4.3.10. Convention on International Civil Aviation (Chicago Convention)

The Convention created a United Nations agency, the International Civil Aviation Organisation (ICAO) in 1944. The organisation sets standards and regulations necessary for

aviation safety, security, efficiency and regularity as well as aviation environmental protection. The organisation serves as the forum for cooperation in all fields of civil aviation among its 190 contracting states Kenya included.

The Civil aviation organizations under this convention have developed criteria for safeguarding airfields as well as the functioning of technical sites such as radar, navigation aids and communication equipment. The safeguarding system ensures that the construction of a building or any other development does not interfere with an airfield's approach radar. The small Hydropower Plant has no impact on aviation at all.

4.4. International guidance and standards

4.4.1. The Equator principles

The Equator Principles refer to a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing. As per the Equator Principles, negative impacts on project affecting the ecosystems and communities should be avoided whenever possible, and if the impacts are unavoidable, they need to be reduced, mitigated and/or compensated for appropriately. In accordance to Equator Principles, potential social and environmental issues the Equator Principle take cognizance include:

- Assessment of the baseline social and environmental conditions;
- Consideration of the feasible environmentally and socially preferable alternatives;
- Requirement under the host country laws and regulations, applicable international treaties and agreements;
- Protection of human rights and community health, safety and security;
- Protection of cultural property and heritage;
- Protection and conservation of biodiversity, including endangered species and sensitive ecosystems in modified, natural and critical habitats, and identification of legally protected areas;
- Sustainable management and use of renewable natural resources (including sustainable resource management through appropriate independent certification systems);
- Use and management of dangerous substances;
- Major hazards assessment and management;
- Labour issues and occupational health and safety;
- Socio-economic impacts;
- Fire prevention and life safety;
- Land acquisition and involuntary resettlement;

- Impacts on affected communities, and disadvantaged or vulnerable groups;
- Impacts on indigenous peoples, and their unique cultural systems and values;
- Cumulative impacts of existing projects, the proposed project, and anticipated future projects;
- Consultation and participation if affected parties in the design, review and implementation of the project;
- Efficient production, delivery and use of energy; and
- Pollution and prevention and waste minimization, pollution controls (liquid effluents and air emissions) and solid and chemical waste management.

For this project, the requirement for adherence to the National Environment Management Authority standards suffices the concerns of the Equator Principles.

4.4.2. IFC Performance Standards

The section summarizes the IFC Performance Standards 1-8.

PS 1: Assessment and Management of Environmental and Social Risks and Impacts

This Standard is similar to the NEMA Environment Regulations 2003. In addition to identifying risks and impacts of proposed projects, it also aims at ensuring that affected communities are appropriately engaged on issues that could potentially affect them.

The Standard requires that the area of influence encompasses, as appropriate:

(i) The primary project site(s) and related facilities that the project proponent (including its contractors) develops or controls, such as power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow, disposal areas and construction camps;

(ii) Associated facilities that are not funded as part of the project (funding may be provided separately by the project proponent or by third parties including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of the project;

(iii) Areas potentially impacted by cumulative impacts from further planned development of the project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken; and

(iv) Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without the project or independently of the project.

The standard has a number of components including management systems, training, community engagement, consultation and grievance mechanisms, actions plans and organizational capacity.

PS 2: Labour and Working Conditions

Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be balanced with protection for basic rights of workers. Good practice for labour and working conditions requires compliance with International Labour Organisation (ILO) and UN conventions and prevention of child labour, i.e., persons under the age of 18 years. The Project proponents would also subscribe to the Country's Labour and Employment Laws and Regulations.

PS 3: Resource Efficiency and Pollution Prevention

The PS requires assessment and effective use of resources as well as prevention and control of pollution in line with good international practice.

PS4: Community Health, Safety and Security

The IFC Performance Standard 4 on Community Health, Safety and Security recognizes that projects can increase the potential for community exposure to risks and impacts arising from equipment accidents, structural failures, and releases of hazardous materials. Communities may also be affected by impacts on their natural resources, exposure to diseases, and the use of security personnel.

The Project Proponent in the proposed project would comply through the avoidance or minimizing risks and impacts on the health and safety of the local community during the project life cycle from both routine and non-routine circumstances. The Project Proponent should also ensure that the safeguarding of personnel property is carried out in a legitimate manner that avoids or minimizes risks to the community's safety and security.

PS 5: Land Acquisition and Involuntary Resettlement

PS 5 requires that all forms of resettlement be addressed and appropriately compensated through the development of Resettlement Action Plans. The Proponent should aim at improving or at least restoring the livelihoods and standards of living of displaced Persons. In this Project there is no resettlement required as the project proponents owns the land required for the sitting of the Small Hydropower Project.

PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

In order to avoid or minimize adverse impacts to biodiversity in the project's area of influence, the significance of project impacts on all levels of biodiversity is an integral part of

the Social and Environmental Assessment process. The assessment should consider critical habitats with high biodiversity value and also legally protected areas. PS 6 presumes against development for certain critical habitats. The project location does not compromise on biodiversity. The Water Resources Authority requires maintenance of environmental Flow in Rivers to sustain the river ecology. This aspect will be adhered to in this project as a condition to secure a Water Allocation Permit.

PS6 will have limited applicability to this site. However, a presumption against the introduction of invasive species, as recommended under PS6, should be observed.

PS7: Indigenous People

The Indigenous Peoples are recognized as social groups with identities that are distinct from dominant groups in national societies, are often among the most marginalized and vulnerable segments of the population. Their economic, social and legal status often limits their capacity to defend their interests in, and rights to, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. They are particularly vulnerable if their lands and resources are transformed, encroached upon by outsiders, or significantly degraded. Their languages, cultures, religions, spiritual beliefs, and institutions may also be under threat. These characteristics expose Indigenous Peoples to different types of risks and severity of impacts, including loss of identity, culture, and natural resource-based livelihoods, as well as exposure to impoverishment and disease. Private sector projects may create opportunities for Indigenous Peoples to participate in, and benefit from project-related activities that may help them fulfil their aspiration for economic and social development. In addition, this Performance Standard recognizes that Indigenous Peoples may play a role in sustainable development by promoting and managing activities and enterprises as partners in development.

The proponent of the proposed project should ensure that the development process fosters full respect for the dignity, human rights, aspirations, cultures and natural resource-based livelihoods of Indigenous Peoples; avoids adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not feasible, to minimize, mitigate, or compensate for such impacts, and to provide opportunities for development benefits, in a culturally appropriate manner; establishing and maintaining an ongoing relationship with the Indigenous Peoples affected by the project throughout the life of the project; fosterers good faith negotiation with and informed participation of Indigenous Peoples when the project is to be located on traditional or customary lands under use by the Indigenous People. The proposed project does not pose any negative impact to the indigenous people within the

project area.

PS 8: Cultural Heritage

This Performance Standard recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, the Contractor will protect and support irreplaceable cultural heritage by undertaking internationally recognized practices for the protection, field-based study, and documentation of cultural heritage. The Project Proponent is responsible for locating and designing a project to avoid significant damage to cultural heritage. There are no sites of cultural heritage within the sitting of the proposed project

4.4.3. ISO 14000 Standards

ISO 14000 is a series of voluntary international standards on environmental management. It provides a framework for the development of an environmental management system, environmental auditing, environmental labelling, environmental performance evaluation and life cycle assessment. The standards provide a framework for a strategic approach to an organization's environmental policies, plans and actions.

An Environmental Management System (EMS) based on the ISO 14000 Standards is a management tool enabling an organization of any size or type to control the impact of its activities, products or services on the environment. It defines a structured approach for;

- Setting environmental objectives and targets;
- Achieving these goals; and
- Demonstrating that they have been achieved.

Because ISO 14000 does not set levels of environmental performance, the standards can be implemented by a wide variety of organizations, whatever their current level of environmental maturity. However, a commitment to compliance with applicable environmental legislation and regulations is required, along with a commitment to continuous improvement.

TECHNICAL DESCRIPTION OF THE DEVELOPMENT

5.1. General Layout

The main objective of the Nzoia II HPP is to generate power economical and expeditiously, utilizing the local available material and labor to the extent possible. The design of the project components has been planned to have simple and cost-effective execution of civil works.

According to the topographical and geological conditions of the project location, the Nzoia II HPP is a weir type hydropower station. The main structures are composed of weir, pressured box culvert, powerhouse, substation and transmission line, etc.

The water retaining structure is gravity type, with crest elevation 1459.00m, the maximum height 25m, and length of the crest 135.23m. The overflow weir is at the left river course, with the crest elevation of 1457.05m and length of 30m. The release sluice is at the middle of the river course, with the invert level of 1451.00m and equipped with three 8m×6.5m top immersed strobes. The scouring sluice is set at the right river course, the invert level of opening is set at elevation 1434.00m and equipped with two 4m×4m submerged strobes.

The intake of pressured box culvert is located on the right weir abutment. Each unit is connected with one 61.32m long box culvert.

There are four vertical Kaplan hydroelectric generating units installed in the main powerhouse. The powerhouse is 51.04m long and 14m wide. The ground elevation of the generator floor and turbine floor are 1439.35m and 1433.19m, respectively. The 33kV transformer yard is located on the upstream of the powerhouse with a ground elevation of 1439.20m. The power will be evacuated through a 3.3km long 132kV transmission line to Webuye132/33kV Substation.

5.2. Retaining and Discharging Structure

The weir is a fine aggregate concrete rubble gravity weir. To decrease the flood water level during flood period, the water retaining structure adopts the combination of overflow weir and release sluice. Length of retaining structure is 135.23m, which include left non-overflow section, headrace intake, scouring sluice, open overflow weir section and right non-overflow section from left to right. Intake is located at right abutment.

5.3. Weir Structure Layout

As result of calculation flood regulation, with the normal water level 1457.00m, the design flood level (P=2%) is 1457.66m, and check flood level (P=0.5%) is 1458.10m. The average annual maximum wind speed is 19.5m/s, with effective fetch length of 0.13km. The weir is defined as grade 4 structure.

5.4. Crest Elevation

The weir crest shall be higher than check flood level. The crest elevation of wave wall shall be higher than wave crest elevation. The freeboard between the crest level of wave wall and the normal water level or the check flood level can be calculated by the following formula, whichever is higher is selected as the elevation

1) Left Non-Overflow Section

The 23.40m long non-overflow section on the right bank is a gravity weir with crest elevation of 1459.00m, and the maximum weir height is 19.00m. The upstream surface is at vertical, the downstream surface is at vertical above 1456.00m, and at a slope of 1:0.75 below, with a crest width of 3.00m and maximum bottom width of 14.02m. The upstream side of the weir crest is provided with wave wall, elevation of the crest of wave wall is 1460.20m.

2) Overflow Weir

The spillway is an open overflow weir type with an effective width of 30m and crest elevation of 1457.05m. When the water level rising exceeds the normal storage level of 0.05m, the water will pass over weir crest automatically. The slope of discharge chute is 1:0.7 and the upstream is vertical. Ski-jump energy dissipation is adopted with a continuous flip bucket in elevation of 1441.00m, the radius of the reverse arc of 6.00m, and flip shot angle of 20°. The maximum height and bottom width of overflow weir are 23.05m and 25.50m respectively.

The main material of weir core is M-15 fine aggregate concrete masonry, and lined with 0.4m-thick M-20 reinforced concrete at upstream and downstream surface, 0.5m- thick M-25 reinforced concrete on surface of spillway.

3) Release Sluice

Release sluice is located at the right side of overflow weir and at the main river channel, installed with three top immersed strobes.

The width of the chamber is 8.00m, and the elevation of base plate, gate crest and maintenance platform are respectively 1,451.00m, 1,457.5m and 1,460.00m. Bulkhead gate grooves are arranged on upstream of each service gate. The gate chamber is reinforced concrete structure, 10.50m long along the flow direction, and the pier 2m thick. Width of maintenance platform at the upstream of gate is of 6.67m, which is also the operating main passage and can meet the cars and crane vehicles traffic. Three hoists shall be equipped in hoist chamber. The elevation of hoist chamber is 1,467.60, and 31.25m long, 4.80m wide. Ski-jump energy dissipation is adopted with a continuous flip bucket in elevation of 1440.00m, the radius of the reverse arc of 8.00m, and flip shot angle of 20°. The maximum

height and bottom width of release sluice are 25.00m.

Three release sluices gates will share one bulkhead gate, and the structure of which is the same as the service gate, and is moved and controlled by a portal crane.

Main function of release sluice is flood and sediment draining. When the flood is coming and water level rises to 1,457.30m, open the sluice gates and control the upstream water level according to the gate opening.

4) Scouring Sluice

Combined in need of construction diversion, two submerged strobes each sized 4.0m×4.0m are set up between the release sluice and the headrace intake. The elevation of the bottom slab, gate maintenance platform and hoist platform are 1434.00m, 1460.00m and 1465.00m respectively. Each sluice shall be equipped with one service gate and one bulkhead gate, both made of flat steel, which is opened and closed by a screw hoist equipped in the hoist chamber.

Two scouring sluices gates will share one bulkhead gate, and the structure of which is the same as the service gate, and is moved and controlled by the portal crane of release sluice.

The downstream of the scouring sluice is a waterfall, and the riverbed is exposed bedrock, the rocks are hard and in good integrity and with strong impact resistance, so it is no need to set energy dissipation structure.

5) Right Non-Overflow Section

The 12.81m long non-overflow section on the right bank is the connection section between the headrace intake and the right bank. The weir is a gravity weir type with crest elevation of 1459.00m, and the maximum height is 19.00m. The upstream and downstream surface are at vertical, with a width of 10.50m. The upstream side of the weir crest is provided with wave wall, the crest elevation of wave wall is 1460.20m.

5.5. Foundation Excavation and Treatment

The upper zone of weak weathered bedrock can be used for gravity weir foundation in view of the weir has a lower height, and the weir sections close to abutments may be more tolerant.

The gravity weir foundation should be excavated along the weir axis to form stepped shapes with a certain width. For geological defects such as local fragmentation or weathering deep trough found during excavation, shall be treated by groove digging, backfilling with concrete in plug shape and consolidation grouting.

The bedrock has integrity and belongs to the weak ~ micro permeable rock, the shallow part has the strong permeability, the deep part has the weak permeability. Except for strongly weathered rock, the permeability is generally less than 5Lu.

Consolidation grouting and curtain grouting is recommended for weir foundation. A row of consolidation grouting holes will be arranged in each upstream and downstream of the weir foundation with a spacing of 2.5m and depth of 5~8m. A row of anti-seepage grouting curtain is arranged along the axis of the weir to form a closed impervious zone with a spacing of 2m and depth of 10m. The anti-seepage standard and permeability rate for the project is determined to be $q \leq 5Lu$. Grouting should be carried out after a certain thickness of foundation concrete is cast.

5.6. Headrace System

The headrace works of Nzoia II HPP consists of intakes and pressured box culvert.

5.6.1. Intake

The intake is a weir type, located between the scouring sluice and the right non- overflow weir section. There are four inlets, each inlet is provided with one trash rack, one service gate and one bulkhead gate respectively. The size of trash rack is 5.0m×6.5m (W×H), and the size of service gate and bulkhead gate is 4.0m×4.0m. The elevation of the bottom slab and gate maintenance platform is 1443.00m and 1459.00m respectively. The maintenance platform is accessible from the right non-overflow weir.

Four hoists shall be equipped in hoist chamber. The hoist chamber for the intake gates and that for the scouring sluice gates are of the same platform elevation of 1465.00m and connected together. In addition, a coarse trash rack will be installed in front of the intake. as the service gate, and is moved and controlled by a monorail trolley above the platform.

5.6.2. Pressured Box Culvert

A pressured box culvert will be set up between each intake and the concrete spiral case of each turbine. The culvert will be reinforced concrete structure. The length of box culvert is 61.32m. The cross section size of the culvert is gradually changed from 4.00m × 4.00m (W×H) to 5.29m × 2.58m. The culvert shall be protected by backfill with excavated spoil to ground elevation of plant area.

5.7. Powerhouse and Transformer Yard

The components at the plant area include the main powerhouse, auxiliary plant, tailrace and transformer yard. The auxiliary powerhouse is set up at the upstream of the main powerhouse, the transformer yard at the upstream of auxiliary powerhouse, and the administration office at the downstream of the powerhouse by the river.

5.7.1. Layout of Main Powerhouse

The main powerhouse consists of two sections, i.e., the unit section and the erection bay, with a total length of 51.04m and a width of 14.00m.

The unit section of the main powerhouse is equipped with four sets of 5MW vertical Kaplan type turbine hydroelectric generating units, with unit spacing of 9m. The installed elevation of turbine is 1,431.70m. The unit section of the powerhouse is divided into two floors, and the elevation of the generator floor and the turbine floor are respectively1439.35m and 1433.19m. The bottom elevation of the draft tube is 1424.62m and the lowest excavation elevation of the foundation is 1,423.32m.

The erection bay is arranged in the left of the main powerhouse and is divided into 2 floors. The upper floor shares the same elevation with the generator floor (1,439.35m), which is the site for the overhaul of the unit and other equipment. The entrance to the powerhouse is located on the downstream side. The lower floor shares the same elevation with the turbine floor (1,433.19m).

The main powerhouse is equipped with a 50t/10t slow electric double-beam bridge crane with a span of 12.0m and the rail top elevation of 1,448.25m. The basis of the main powerhouse is a reinforced concrete block structure, and the upper part is a reinforced concrete frame structure, with a roof of steel plate with light steel frame structure.

5.7.2. Layout of Auxiliary Powerhouse

The auxiliary house is located at the upstream of the main powerhouse, with a total length of 51.04m and width of 6.5m. The auxiliary house is divided into two floors. The upper floor is at the same elevation with the erection bay (1,439.35m) and is furnished with central control room, high voltage switchgear room and office. The lower floor shares the same elevation with the turbine floor (1,433.19m) and is furnished with tools & spare parts room, pump room, compressor room, oil treatment room, service transformer, and excitation transformer chamber.

The base of the auxiliary house is a reinforced concrete floor and a shear wall structure, and the upper part is a reinforced concrete frame structure, with a roof of cast-in-site reinforced concrete beam and slab structure.

5.7.3. Layout of Tailrace Structure

There is a gate slot for overhaul at each draft tube outlet, with the size of reserved hole of 6.86m×2.92m (W×H). Four draft tubes share one bulkhead gate, the bulkhead gate will be moved and controlled by a monorail trolley above the platform. The elevation of the gate maintenance platform is of 1,434.86m.

Tail water will directly flow into the river, normal tail water level is 1,434.35m in full load operation and minimum water level is 1,433.26m when one unit is in operation. The design and check flood level is 1,459.31m and 1,459.56 respectively.

5.7.4. Layout of Transformer Yard

33kV substation is arranged at the upstream of auxiliary powerhouse, with length 23m and width 12.9m. The substation is at the same elevation with the plant area (1,439.20m). Two oil-immersed transformers are equipped inside and are connected to Webuye 132/33kV Substation through a long 3.3km 33kV transmission line.

5.8. Layout of Access Road and Management house

5.8.1. Access Road

(1) **External transportation**

The powerhouse site is currently a simple sand mining site, which can be accessible through an 1100m long unpaved backroad departing from National Highway A104. Thus, the access road will be rebuilt on the existing backroad.

(2) **Internal transportation**

Internal transportation is mainly built to meet the needs of operation and management of the power plant. The newly built road from the right weir abutment to the plant area is 300m. The internal road is a concrete pavement with a width of 4m.

5.8.2. Living and Administration Facilities

The living and administration facilities shall be set up at plant area by the river with ground elevation of about 1439m, and are about 100m from the powerhouse. The recommended total building area of the living and administration building is about 600m^2.

5.9. Turbine and Accessory Devices

5.9.1. Selection of Turbine

According to the operation range of the water head, the suitable turbine for this power plant is propeller and Kaplan type. Nzoia II HPP is a small power station with low head and large discharge, with the water head varies slightly but flow varies strongly. In view of the operation with small flow during the dry season, three sets of Propeller turbines and one set of Kaplan turbine are suitable for the project. The Kaplan runner has a good average efficiency, a widely operation range with a good adaptability for water head and flow varied especially in dry seasons, but high cost and complicated maintenance. The Propeller unit can run stably by sufficient water, and its price and maintenance cost are all lower than Kaplan unit. The models suitable for Nzoia II HPP are runner type ZZ550, ZZ608 and ZZ660. These models all have high efficiency higher than 90% and good performance parameters.

5.9.2. Selection of Governor

According to the calculation of governing capacity, and the selection of control method, the Kaplan unit is equipped with computerized automatic governor with dual-regulation via high

oil pressure. The model of governor is YWST-7000, and its operating oil pressure is 16MPa. The propeller units are equipped with computerized automatic governor via high oil pressure, the model is YWT-7000 and its operating oil pressure is 16MPa as well.

5.9.3. Selection of Auxiliary Equipment

(1) Crane

The heaviest piece of the electro-mechanical equipment is the generator rotor which is about 43t. The crane is of double beam bridge with capacity of 50/10t, the span of 12 meters.

(2) Oil System

An oil treatment room is furnished in the powerhouse for filtering and cleaning the oil, equipped with oil tank, oil filter, oil pump, drying oven and other relate equipment inside. The oil system equips one LY-50 type oil filter press, one KCB type oil pump, and one DX-1.0 type oven with filter paper.

(3) Compress Air System

A Compress air system is furnished in the powerhouse for unit brake, maintenance, and main shaft sealing, equipped with two V-0.36/7 type air compressors and two air tanks inside. The unit air displacement of air compressors is 0.36m^3/minute with a displacement pressure of 0.7MPa, and operating with one for service and the other one for standby. The air tank's operating pressure is 0.8MPa.

(4) Cooling Water Supply System

The supply of cooling water adopts internal recycling method and tail water cooler. The cooling water flows by gravity from the high cistern to supply to the units and after the water flows through the units, it cools in the tail water cooler and then goes to the water recycling tank.

The recycling tank is set up at the main powerhouse, and the high cistern on the top of right non-overflow weir. The water in the recycling tank is conveyed to the high cistern through two service pumps and one standby pump. Water pipe and water level sensor are equipped in the two tanks. Each main water supply pipe is equipped with an electrical valve for controlling the startup/shutdown of the cooling water automatically. The cooling water will be supplemented by tap water. Two tailrace coolers are set at the tailrace outlet.

(5) Drainage System

The leaking water and main shaft sealing water flow into the water-collecting well. The plant is equipped with two pumps to pump the water from the well to the tailrace. The pump operates in one for service and the other one for standby mode, which is controlled by the water level annunciator. The capacity of the pump is 14~45m^3/h, with a pump head of

10~16m.

During unit maintenance, ponding in the penstock, spiral case, and the draft tube shall flow into the draft tube by gravity, and then discharged to the tailrace by a mobile submerged pump. The capacity of the submerged pump is 25~45m^3/h, and the pump head is 10~14 m.

(6) Hydraulic Measuring System

The measuring items include:

a. The water level of reservoir, fore bay and tailrace, and the gross water head
b. The pressure difference between upstream and downstream of the trash rack
c. The pressure of the spiral case inlet
d. The vacuum value of the draft tube

(7) Heating and Ventilation

The powerhouse is naturally ventilated considering that the plant is situated in the open place with the windows around powerhouse. Thus, one air-conditioner in the central control room is suitable for ventilation.

(8) Fire Fighting Water System

The fire-fighting water will be mainly supplied from the reservoir, filtered by a water filter and pressurized by a fire pump to fire hydrants. The standby water for emergency is from the tailrace.

5.10. Main Equipment List

Table 5.1-Main Equipment List of Turbine and Accessory Devices

No.	Description	Model	Qty.	Remark
1	Turbine	ZD608-LH-240	3	
		ZZ608-LH-240	1	
2	Governor	YWT-7000	3	
		YWST-7000	1	
3	Automation components		4	
4	Crane	50/10t, span 12m	1	
5	Centrifugal pump		3	Cooling water system
6	Tail water cooler		2	Cooling water system
7	Electrical valve		4	Cooling water system
8	Submersible pump		2	Drainage system
9	Mobile submersible		1	Drainage system

	pump			
10	Fire pump		1	Fire-fighting system
11	Water filter	ZLSH	2	Cooling water system & firefighting system
12	Air compressor	V-0.36/7	2	Compress air system
13	Air tank	C-2/10	2	
14	Air-water separator		2	
15	Oil tank		2	Oil system
16	Pressure oil filter	LY-50	1	
17	Oil pump	KCB	1	
18	Oven	DX-1.0	1	
19	Air conditioner		2	

5.11. Electrical Engineering

5.11.1. Grid Connection Method

With a total capacity of 20MW, Nzoia II HPP undertakes the base load of the grid because of its no regulation capability. Four hydroelectric units are installed with 5MW each and the voltage of the generator is 6.3kV. After this generation voltage is stepped up to 33kV with the help of transformer, the power generated from Nzoia II HPP shall be evacuated to the grid via a 3.3km long 33kV transmission line to Webuye 132/33kV Substation.

5.11.2. Main electrical connection

(1) Main Electrical Connection

The 6.3kV side of generator adopts single busbar connection method, i.e., two units connecting one transformer, which means there are two transformers serve four units. Breakers will be equipped at the generator outlet sides, main transformer 6.3kV side and outlet 33kV side for protecting the generator, transformer and transmission line.

(2) AC Service Power System

The service power satisfies the power demands of the powerhouse and the weir area by a 380/220V low voltage power system (three-phase, four lines). To guarantee the security of the power supply, the service power supply includes three circuits: one of which is from the 6.3kV bus via the service transformer (315kVA), another one is 10.5kV standby power via the service transformer (combined in need of construction), and the rest one is from a diesel generator as an emergency power supply to guarantee the security of the service power supply.

The sequence of the service power supply is as follows:

i) From the service transformer when the units are in operation

ii) From the standby transformer during shutdown all the generators

iii) From the diesel generator when above conditions are unavailable

5.11.3. Main Electrical Equipment

To satisfy the demands of different working conditions such as the operation, maintenance, short circuit, etc., energy-saving, environmental, safe, and reliable equipment shall be priority selected.

1. Generator

Type	Synchronous, vertical shaft
Model	SF5000-20/4250
Rated power	5000 kW
Rated voltage	6.3kV
Rated speed	300 r/min
Rated frequency	50 Hz
Power factor	0.80（lag）
Rated efficiency	96%
Excitation mode	SCR excitation control

2) Main Transformer

Model	3 Phases, duplex winding, oil-immersed
Rated capacity	12.5MVA
Voltage combination	36±4×2.5%/6.3kV
Rated frequency	50Hz
Wire connecting mode	YN，d11
Impedance voltage percentage	10.5
Cooling mode	Self-cooling/air cooling
Layout mode	Outdoor

(1) 6.3kV and 33kV Electrical Equipment

The 6.3kV and 33kV electrical equipment are all installed indoor. They are made of steel-clad movable-type switch device, which is composed of cabinet and handcart.

The cabinet is a fully assembled structure which is divided into several functional zones: busbar compartment, circuit breaker compartment, cable compartment and meter compartment. Handcart will be equipped with vacuum circuit breaker, voltage transformer, arrester and isolation switch, etc.

a. 33kV Circuit Breaker

Model	Three phases, vacuum circuit breaker, handcart type
Rated voltage	40.5kV
Rated current	1,250A
Rated frequency	50Hz
Rated short circuit breaking current	31.5kA
Rated short circuit making current	80kA
Rated dynamic current	80kA
Rated short-time withstand current (4s)	31.5kA

b. Generator outlet circuit breaker

Model	Three phases, vacuum breaker, handcart type
Rated voltage	12kV
Rated current	1,250A
Rated short circuit breaking current	31.5kA
Rated short circuit making current	80kA
Rated impulse withstands current	80kA
Rated short-time withstand current (4s)	31.5kA

5.11.4. Lightning Protecting and Grounding

(1) Lightning Protection

Lightning strip shall be installed above the powerhouse roof, and connected to the grounding grid by lead wires. The same layout is applied for hoist chambers of each gate. A group of lightning arresters are installed for the 33kV outlet side, the 6.3kV side of transformer, and

the 6.3kV busbar to prevent the over voltage of the lightning inductance

(2) Grounding Grid

The grounding grid of powerhouse requires that natural grounding objects including the reinforce-steel bars in the beam and column of the powerhouses, and the draft-tube gates are connected with the grounding grid in the plant. The horizontal grounding grid of outdoor transformer is connected to the grounding measure well with the grid of powerhouse. The grounding resistance shall be less than 4 Ohm.

The material of the main grounding grid is 50 x 5 galvanized flat steel. All equipment is connected to the grid with 40 x 5 galvanized flat steel.

5.11.5. Illumination

The illumination includes normal and emergency service. The emergency illumination is normally powered by service power supply (AC) and will be a part of the normal illumination. The emergency power (DC) will be put into use automatically, once AC power supply is unavailable.

5.11.6. Monitoring, Protection and Communication System

(a) Control Mode

The SCADA system of Nzoia II HPP is designed for an unattended (or few-on-duty) automatic control of the main electro-mechanical equipment, and supplemented with simple local manual control.

(b) Computer Supervisory Control

The computer supervisory control system of Nzoia II HPP will adopt whole distributed architecture and layer architecture, that to adopt the function and monitoring object distribution mode and distributed database system. To realize the data information sharing, various devices of computer monitoring system form LAN through network components in the form of nodes. The real-time database of computer monitoring system is distributed in different computers of main control level equipment. All functions of the computer monitoring system are completed by the computer equipment distributed on the system network. Each node computer device strictly performs the assigned task and communicates with other nodes through the system network.

(c) Generator Excitation System

The generator excitation system will be a microcomputer based double-channel excitation control system. Each system has one cabinet, is equipped with excitation regulator, power units and de-excitation device.

(d) Unit Auxiliary Control and Common Service Control Equipment

The unit auxiliary control equipment of Nzoia I HPP includes one cooling water supply control system, one air compressor centralized-control system and one leakage drainage control system.

Both the unit auxiliary control and common service control equipment will be automation products. The core control component of PLC will be Medicon M340 /S7-200. The AC contactor, soft starter and thermo relay will be Schneider or ABB products.

Relay Protection

Microcomputer based protection protector will be equipped for the generators, transformers and 33kV transmission line. Each generator will be equipped with one generator protector cabinet, and there are totally three cabinets. The main transformer will be equipped with one main transformer protector cabinet. One transformer line and service transformer protector cabinet will be equipped for the 33kV transformer line and the service transformer

Service Power System

The 0.4kV AC system panel equipped one automatic power switch system (two inlet circuits to one bus) to guarantee the emergency power supply can be used automatically.

The DC system is equipped with a set of lead-acid battery (150Ah maintenance-free). There are four charging modules with N+1 working method. There are three panels include two battery panels and one charging-feeding panel.

(e) Automatic Fire Alarm System

Automatic fire alarm system is designed as a "centralized alarm system", which will be equipped with a code transmission bus system to connect and control all detectors, alarm and other linkage machine equipment in the system. Fire protection control center will be integrated with the plant central control room.

(f) Industrial Television System

The main equipment and site of hydropower station can be monitored in real-time by industrial TV system from the central control room or remote dispatching center to learn the live situation of the entire hydropower station through the television pictures, providing reliable on-site real-time information for the safe operation of the power station. Simultaneously, cameras will be installed in some important areas of the plant and areas that are difficult to reach for the personnel, and transmit the acquired image information to the power station control center at any time, to reduce the labor intensity of power station inspectors, improve the safety of remote operation, production management efficiency and automation level.

(g) Communications

The communication system of Nzoia II HPP includes the following components:

(1) Plant production dispatching management communication

(2) Communication system coordination and external communications;

(3) Communication power;

(4) Integrated communication line network.

AC power for communication devices will be supplied from different bus segments of the service power via dual circuit as the main power supply. AC uninterruptible power for digital recording system will be supplied from 48V DC power system with an inverter

5.11.7. Main Equipment List

Table 5.2- Main Electrical Equipment List

No.	Description	Specification	Qty.	Remark
1	Generator	SF5000-20/4250	4	Synchronous, vertical shaft
2	SCR excitation system		4	
3	6.3kV voltage equipment			
3.1	Generator circuit breaker cubicle	Steel-clad movable-type	4	Generator outlet
3.2	Generator PT cubicle	Steel-clad movable-type	4	Generator outlet
3.3	Circuit breaker cubicle of main transformer	Steel-clad movable-type	2	Low voltage side
3.4	6.3kV bus PT cubicle	Steel-clad movable-type	2	
3.5	Circuit breaker cubicle of service transformer	Steel-clad movable-type	2	
3.6	CT of generator neutral point	750/1A,0.5/5P20/5P20	12	Windshield of generator
4	Main transformer	12500kVA,36±4×2.5%/ 6.3kV	2	
5	33kV voltage equipment			
5.1	Circuit breaker cubicle of main transformer	Steel-clad movable-type	2	High voltage side
5.2	Circuit breaker cubicle of 33kV outlet	Steel-clad movable-type	1	
5.3	PT and lightning arrester cabinet of 33kV bus-bar	Steel-clad movable-type	1	
5.4	PT cabinet of 33kV outlet	Steel-clad movable-type	1	
6	Service power system			
6.1	Service transformer	315kVA,6.3±2×2.5%/0.4kV Epoxy resin casting	2	With shell

6.2	Standby service transformer	200kVA,11±2×2.5%/0.4kV Epoxy resin casting	1	
6.3	Diesel generator	200kW, 400/230V	1	
6.4	Low voltage distribution cubicle	With drawable	6	
6.5	Transformer cabinet of standbyservice power	Steel-clad movable-type	1	
6.6	Power cubicle	Stationary	5	
7	Computer monitoring and controlsystem			
7.1	Central control computer system		1	Including software
7.2	Unit LCU cubicle		4	
7.3	Communal LCU cubicle		1	
7.4	Unit protection cubicle		2	
7.5	Main transformer and transmission line protection cubicle		1	
7.6	Service transformer and Circuit protection cubicle		1	
7.7	Measuring devices cubicle		1	
7.8	Image (video) surveillance system		1	
7.9	UPS power cubicle	5kVA	1	
7.10	Oil pump control cabinet forgovernor		4	
7.11	Automation elements for communal parts	Water level transmitter, float switch, pressure display controller,	1	

		etc.		
8	DC system			
8.1	Electricity feeder cubicle		1	
8.2	Battery cubicle	18 pieces of 200Ah batteries	2	
9	Image (video) surveillance system			
9.1	DVR	16 channels, 4TB hard drive	1	
9.2	LCD monitor	32 inch	1	
9.3	Network control keyboard		1	
9.4	HD infrared network dome camera		7	
10	Communication system		1	
11	Firefighting system		1	
12	Cable, cable tray and support			
12.1	High voltage power cable		1	
12.2	Low voltage power cable		1	
12.3	Control cable		1	
12.4	Network cable		1	
12.5	Cable trays and supporting		1	
13	Lighting system		1	
14	Grounding system		1	

5.12. Layout of Electromechanical Equipment

There are four vertical hydroelectric generating units in the main powerhouse. The span between main units is 9m, the governor, excitation cubicle, LCU cubicle, temperature

measuring & brake panel will be installed at the upstream of each unit.

Inside the auxiliary powerhouse, excitation transformer and auxiliary transformer room, spare parts room, pump house, air compressor room, oil treatment room are arranged on the turbine floor. The excitation transformer and auxiliary transformer room is equipped four housed epoxy resin cast dry-type excitation transformers, one housed resin cast dry-type service transformers and one housed epoxy resin cast dry-type transformer standby service transformer.

The 6.3kV high voltage switchgear room, 33kV high voltage switchgear room, central control room, office room and tool room are on generator floor. Four generator circuit breaker cubicles, four generator outlet PT cubicles, two breaker cabinet for main transformer's low voltage side, two breaker cabinet for service transformer, one 6.3kV bus PT cabinet, and one standby service transformer inlet cabinet are installed in 6.3kV high voltage switchgear room. Two breaker cabinet for main transformer's high voltage side, one circuit breaker cubicle of 33kV outlet, one 33kV outlet PT panel, one 33kV bus-bar PT and lightning arrester panel are installed in 33kV high voltage switchgear room.

Four generator protection panels, one main transformer and transmission line protection cubicle, one service power and circuit protection panel, one communal LCU panel, one network video panel, one measuring device panel, one UPS panels, three DC system panels, and three low voltage power dispatching panels are installed in the central control room.

Inside the transformer yard there are two oil-immersed transformers will be installed.

5.13. Hydraulic Metal Structures

5.13.1. Release Sluice Gates

There will be three release sluices are proposed to divert the flood safely downstream, each of them will be equipped with a top emersed strobe. The invert level is fixed at elevation of 1,451.00m which is 6.05m below the crest of the open spillway weir. The size of the gate is 8.0m wide and 6.5m high. During the dry season these gates will be closed to divert water into headrace box culvert

The sluice gate is vertical fixed wheel type, made of steel Q235A. The gate can be closed and opened in flowing water. The gates are operated by a wire rope hoist with double hook, and capacity is of 2×160kN. One hoist is installed for each gate at the platform with elevation of 1,467.60m. The elevation for the maintenance platform is 1,459.00m.

Bulkhead gate grooves are arranged on upstream of each service gate. Three release sluices will share one bulkhead gate, and the structure of which is the same as service gate. The bulkhead gate can be opened and closed in standing water. The gate is normally locked with

locking beam at the maintenance platform with elevation of 1459.00m. The bulkhead gate will be operated and moved by a gantry traveler, which has a capacity of 2×160 kN and traveling on 1,459.00m platform.

5.13.2. Scouring Sluice Gates

There will be two submerged strobes installed at the scouring sluice. The size of reserved hole for sluice gate is 4.0m×4.0m (W×H) with bottom elevation of 1,434.00m. The normal water level of the reservoir is 1,457.00m, and maximum flood level is 1,458.10m. The design water head for the gate is 24m.

The sluice gate is vertical fixed wheel type, made of steel Q235A. The gate can be shut off in flowing water and opened in flowing water also. Screw hoist with double hook with a capacity of 2×400kN will be adopted. The elevation of gate maintenance platform is 1,459.00m and the elevation of hoist platform is 1,465.00m.

There is a gate slot for overhaul at upstream of each sluice gate. The bulkhead gate has the same size of the service gate, and it shall be closed and open hydrostatically. The gate is normally locked with locking beam at the maintenance platform on elevation of 1,459.00m. Two service gates share one bulkhead gate. The bulkhead gate will be operated and moved by the portal crane of release sluice.

5.13.3. Coarse Trash Rack

A coarse trash rack is installed in front of the intake, and meets the center line of intake at 45°. The length of trash rack is 14.75m, the width and crest elevation of operating bridge are 1.2m and 1,458.00m respectively. The coarse trash rack is fixed and made up of U-steel and flat steel. The material of the trash racks is steel Q235A. The interval between bars will be no more than 0.15m, and manually clean.

5.13.4. Intake Trash Racks

There is a trash rack installed at each box culvert inlet. The size of the trash rack is 5.5m×6.5m (W×H). The bottom elevation of the trash racks is 1,441.50m. It is flexible and of welded steel structure. The design water head is 0.5m. The material of the trash racks is steel Q235A. The interval between bars will be no more than 120mm. The trash racks should be cleaned manually and it could be erected by chain blocks

5.13.5. Intake Gates

A service gate is installed downstream of each trash rack with the size of reserved hole of 4.0m×4.0m (W×H), and bottom elevation of 1441.50m. The normal water level of reservoir is 1457.00m, and maximum flood level is 1458.10m. The design water head for the gate is 16m. The service gate is submerged strobe type made of Q235A steel. The gate can be shut

off in flowing water and opened in flowing water also. Wire rope hoist with double hook will be adopted, with a capacity of 2×160kN. It is an emergency wire rope hoist, can shut down the intake in a short time. The elevation of gate maintenance platform is 1459.00m and the elevation of hoist platform is 1465.00m.

There is a bulkhead gate slot for overhaul in the gate chamber front of each service gate, the size of reserved hole for bulkhead gate is same with the service gate and it can be opened and closed in standing water. The gate is normally locked with locking beam at the maintenance platform with elevation of 1459.00m. Four service gates share one bulkhead gate. The bulkhead gate are operated and moved by a service monorail trolley crane.

5.13.6. Draft Tube Gates

In order to provide for inspection and maintenance of the turbines and draft tubes, it shall be installed guides for setting of draft tube gates at the downstream end of the draft tube for each of the four turbine units. The size of reserved hole will be 6.86m×2.93m (W×H). Four draft tubes share one bulkhead gate. The draft tube gate shall be operated by a service monorail trolley crane. The gate shall be operated at the normal tail water level, and under equalized water pressures (H<1m). The elevation of gate's maintenance platform is 1434.85m

5.14. Construction Condition

5.14.1. Equipment and Material Transportation Plan

The project's site is located 2km downstream of the Webuye Water Fall in Nzoia River which is also border line between Kagamega and Bungoma County. The Power Plant is located at the suburbs of Webuye town in Bungoma County, the right bank of Nzoia River, approximately 4km from down town of Webuye, 383 km from Nairobi, 864km from Mombasa port.

All the import equipment and material will be delivered to Mombasa port and then transported to the site via road which is around 861km. The detail of the transport is Mombasa-Nairobi-Nakuru-Eldoret-Lwandeti-Project's site. The road from existing highway to the project's site will be about 1.2km long. Besides, other construction material will be purchased from local market and transported by truck.

5.14.2. Engineering Layout

According to the topographic and geological conditions of the area, Nzoia II HPP is a weir type hydropower station, and the main buildings include the overflow weir, release sluice, headrace culvert, powerhouse and transformer yard, etc. The water retaining structure is gravity type, with crest elevation of 1459.00m, the maximum height 25m, and length of the crest 135.23m. The overflow weir is at the left river course, with the crest elevation of

1457.05m and net length of 30m. The release sluice is at the middle river course, with the bottom elevation 1451.00m and equipped with three 8m×6.5m top emersed strobes. The powerhouse will be set up at the right bank about 55m downstream of the weir. There are four vertical Kaplan hydroelectric generating units installed in the powerhouse, the capacity of each unit is 5MW.

5.14.3. Climate

Nzoia II HPP is located in the Western Region of Kenya. The climate of Western Region is generally cooler than that of the rest of Kenya, due to the region's higher altitude. The temperature varies between 7ºC to 30ºC. The mean annual rainfall of the Webuye town is 1100mm. According to analysis of data provided by the meteorological station, compared with the raining pattern of Nairobi region, the double peak feature of the annual raining pattern is not distinct in this basin. The wet season starts from April to September and only in June there is a bit less precipitation, which is also close to the average rainfall.

5.14.4. Power and Water Supply and Communications

The 10.5kV transmission line will be erected from Webuye 33/11kV Substation Station to powerhouse site, the length will be 3.3km, and capacity of the transformers is 200kVA. The 10.5kV power supply will be used as standby power supply once the construction period ends. A diesel generator will be needed as a standby power supply for construction.

The water for construction can be conveniently pumped from Nzoia River, domestic water can be conveniently drawn from the nearby pipe.

The mobile communication signal is available in the construction area**.**

5.14.5. Main building material

Cement, steel bars, steel and explosives will be purchased from Eldoret while timber will be bought from markets around Webuye. There is no grit material in the project area. Therefore, artificial aggregate shall be used for concrete, made from stone, from the foundation of weir and powerhouse excavation.

5.15. River Diversion during Construction

5.15.1. The Opportunity for River Diversion

The discharge of Nzoia River in flood season and dry season changes greatly. To saving temporary construction cost, it is planned that the river diversion will be implemented in dry season. According to the analysis of hydrological characteristics and construction schedule, the period of river diversion is designed to be from November to April for first stage cofferdam and December to March for second stage cofferdam, and the design discharge will be 263 m^3/s and 169m^3/s respectively.

5.15.2. Type of River Diversion

According to the layout of the weir complex and the topography and construction conditions, it is suitable for phased diversion. As the designed diversion procedures, in the first year from December to March, the right river channel will be enclosed by cofferdam, the water will be diverted through the left river channel, the foundation excavation, concrete casting and installation of the gate groove of the intake gates, scouring sluice gate and release sluice gates will be carried out. From December to March of the second year, the left river channel will be enclosed by cofferdam, and the water will be diverted from the scouring sluice and implement the construction of overflow weir and left non-spillway weir section. Two stages will switch within two dry seasons.

5.15.3. River Diversion Works

(1) Left diversion channel

According to the topographic conditions of the riverbed at the weir site and considering the arrangement of the first phase longitudinal cofferdam, the left riverbed and the right bank will be excavated in advance to form a diversion channel. The bottom of the diversion channel will be 15m wide and 40m long, with a slop of 1:100. The bottom elevation of the entrance of diversion channel is designed as 1434.00m.

(2) First stage cofferdam

The cofferdam adopts earth cofferdam type. The cofferdam has a trapezoid section with a crest width of 4m, and the inner slope of 1:1.5. The outer slope of upstream cofferdam and longitudinal cofferdam is 1:0.25, and will be protected by woven bag. The upstream cofferdam is 40m long, with the crest elevation of 1,437.60m, the maximum height of 5m. The longitudinal cofferdam is 35m long, with the maximum height of 5.3m. The downstream cofferdam is not need due to the downstream waterfall.

(3) Second stage cofferdam

Structure and type of second-stage cofferdam is same with that of the first stage, with the crest elevation of 1,440.00m. The upstream cofferdam is 35m long, and longitudinal cofferdam is 35m long, the maximum height of 6m. The downstream cofferdam is not need due to the downstream waterfall.

5.16. Construction of Main Works

Main structure of Nzoia II HPP consists of the overflow weir, release sluice, headrace culvert, powerhouse and transformer yard, the construction method is as follows:

5.16.1. Construction of Weir

(1) Foundation excavation

The overburden and weathered rock on both abutments should be excavated firstly, and the foundation excavation of the riverbed should be carried out after the cofferdam is closed.

The overburden could be excavated with backacter, and the excavated materials will be transported to cofferdam or the spoil yard by 5t dumpers. Bedrock shall be drilled and stratified excavated by shallow hole blasting method. Remove the sharp angle and loose rock manually, and clean the bedrock surface with high pressure water before pouring of concrete. Part of the ballast will be rolled into artificial aggregate, and most of the ballast will be transported directly to spoil yard.

(2) Construction of weir

A tower crane will be installed between the weir and the powerhouse on right bank to convey material for construction of weir. The concrete could be transported by the tower crane to working surface directly, or by chute or concrete pump or dump court.

5.16.2. Construction of Powerhouse

Foundation excavation of box culvert and powerhouse shall be carried out simultaneously. The overburden and weathered rock should be excavated firstly with backacter, and excavate bedrock layer by layer by blasting method. Transport the excavated material to spoil yard by backacter and 5t dumpers. The excavated material will be used to backfill the plant area.

A tower crane will be installed at the plant site to transport the material for construction of powerhouse. Clean the bedrock surface before pouring plain concrete cushion. Trestle bridge will be set up above working surface during the construction of base structure. Concrete will be transported to working surface by crane or by concrete pump, vibrate with concrete vibrator then. The whole chamber of concrete will be poured continuously. Scaffold will be set up for upper structure. Concrete will be sent to working surface by crane. Wood formworks will be used on draft tube and parts with curved surface, and steel formworks will be used mainly on other parts.

5.16.3. Installation of Equipment and Metal Structure

Equipment to be installed inside the powerhouse includes four sets of 5MW generating units and one set of double-beam bridge crane, etc. The equipment could be installed once the upper structure of powerhouse is completed. The tower crane will be used for installation of the bridge crane in the powerhouse before the roof is completed.

Installation of hydraulic metal structure mainly includes the installation of release sluice gates, scouring sluice gates, trash racks, intake gates, draft tube gate, and hoists etc. Gates, trash racks and hoists will be manufactured in the factory, transported to site by automobile and installed with tower crane or mobile crane. Since metal embedded parts shall be installed

during the concrete construction process, installation of embedded parts shall coordinate with civil works construction.

5.17. General Layout of Construction

The civil works is more concentrated, and the site is more open. According to the characteristics of complex layout, construction facilities, living facilities and construction management center are centrally arranged on the right bank.

5.17.1. In-site Transportation

There is existing backroad available from A104 National Road to the weir site on both banks presently. An about 300m long of new temporary construction road need to be built to weir abutment on both banks, and which can be used as a permanent access road after the completion of the project.

5.17.2. Construction Facilities

The construction facilities are arranged on the right bank gentle slope by the river, where is located within the scope of permanent land acquisition, the elevation is 1,435 ～ 1,440m, and it will be filled with excavated materials from weir and powerhouse foundation.

The construction facilities will include concrete mixing system, warehouse, comprehensive processing plant, aggregate storage yard. Part of the permanent office and living facilities of the power station can be constructed for temporary use during construction. After the project is completed, it will be decorated and handed over to the owner.

The air for the rock excavation will be supplied by mobile air compressor and the water will be pumped from the river, and domestic water can be drawn from the nearby pipe. Power supply for construction will be provided from the temporary 200kVA transformer connected to the national grid through an 11kV transmission line from Webuye 33/11kV Substation Station. A 100kW diesel generator is prepared as emergency power supply once the grid fails

5.17.3. Earth-rock Balance and Spoil Yard Planning

Total quantity of earth excavations, rock excavations are 36,110m^3 (solid, following is the same) and 70,426m^3 respectively. About 50,000m^3 of excavated material can be used as artificial aggregate, and about 24,569m^3 of excavated material will be used for backfilling of building. The remaining 31,967m^3 of excavated material will be all used for backfilling of the living and administration facilities area.

5.17.4. Construction Site

According to the general layout of the project and general layout of construction, construction site area covers about 3.65ha (Exclusive of transmission line corridor), including 3.07ha for

permanent occupied land and 0.58ha for temporary occupied land. The permanent occupied land is concentrated in weir site and the plant site, the temporary occupied land is concentrated in temporary construction roads.

5.18. General Construction Schedule

The engineering scale of Nzoia II HPP is moderate, with many work surfaces but no construction difficulty. According to preliminary analysis, the key component to control the total construction period is the construction of weir. The construction of weir shall be the core factor to be considered when planning the general construction schedule so as to complete the project in shortest time with reasonable cost.

According to the general layout, construction condition and river diversion scheme, it is determined that total construction period for this project will be 23 months based on analysis of the controllable quantities such as weir, headrace system, powerhouse, etc.

The general construction schedule is as follows:

5.18.1. Pre-construction Period (before October of the First Year)

Pre-construction period will be completed before October of the first year when the owner will finish all the preparatory work, includes of land acquisition, tendering, formation of construction management and supervision team, and the contractor arrive at site for preparation work and carry out the work of cofferdam material preparation.

5.18.2. Main Construction Period (to April of the Third Year)

The main construction period lasts from the start of main works to the commissioning of the unit generate; this period will start from the early October of the first year.

a. Weir works

Construction of first stage cofferdam will start from early October of the first year, and foundation excavation of the weir will be carried out at the same time. Construction of the cofferdam should be completed by mid-November. After the foundation pit formed, start the foundation excavation and concrete pouring of the scouring sluice and intake. The concrete construction elevation will reach 1,459.00m and complete the installation of gate grooves by the end of March of the second year. The construction of upper structure will continue then, until the gates and hoists are installed.

Construction second stage coffer weir will start from early November of the second year, foundation excavation and concrete pouring of release sluice section, overflow weir section and left non-overflow section will be carried out at the same time, which will be completed by the end of April.

b. Powerhouse

Foundation excavation of powerhouse will start from mid-October of the first year, and shall be carried out simultaneously with the foundation excavation of box culvert. The concrete construction of the first stage concrete of powerhouse must be carried out once the foundation excavation of box culvert is completed, and will be completed by end of June at the second year.

5.18.3. Installation Period (to May of the Third Year)

The installation of electromechanical equipment and decoration of powerhouse will start after the completion of the first stage concrete of powerhouse. Installation of the first unit will start from early of July of the second year, and installation of electromechanical equipment will be completed by the end of May of the third year. The remaining civil and finishing works will be carried out within this period. The first unit will be commissioned at the early of May of the third year.

5.18.4. Finalization Period (to August of the Third Year)

Finalization period starts from early of May of the third year, and the main work in this period includes finalizing work, fencing, ground hardening, site cleaning, demobilization, landscaping and commissioning of all units. Up to end of August of the third year, the project will be complete.

STAKEHOLDERS CONSULTATION.

6.1. Introduction

Stakeholders' public consultation is a core requirement by the National Environment and Management Authority (NEMA) and other organizations for conducting environmental assessment process. The aims of public consultation are;

- Disclosure of the planned activities of the proposed project and impacts identified through the Environmental and Social Impact Assessment;
- Identification of concerns and grievances from interested and project area community;
- Harnessing local expertise, needs and knowledge from interested people; and
- Response to grievances and enquiries by the area community.

Public consultation meetings were conducted with the local community residents and local administration leaders responsible for the area the Small Hydropower Project (SHPP) is situated. The approach adopted included public meetings and administration of questionnaires to individual persons in the neighboring the project area.

The public consultations provided a forum to inform stakeholders of the proposed small hydropower project and provide them with an opportunity to state their views and concerns. The information obtained from the public consultations is incorporated into the Environmental Management Plan (EMP).

6.2. Public Consultation

The Public Participation (PP) was conducted in the second week of March 2021 (7th March-14th March 2021). This was after a week- long sensitization of the project in the last week of February 2021 (20th February, 2021 – 1st march 2021). During the sensitization the local administration (chief, assistant chief, community leaders, county leaders) held meetings where the project was introduced and the leaders involved in the identification and identification of the community to attend the public consultation meeting.

The PP conducted on the 9th of March 2021 at Fall View Hotel, Webuye. The attendance and participation were very good. The minutes of the deliberations during the meetings have been attached in this report.

6.3. List of Attendants

The following is the list of the attendance for the Public Consultation meeting;

1. Prof BNK Njoroge
2. Mr. Francis Muturi
3. Mr. Peter Ndirangu

4. Mr. Edwin shivach
5. Samuel Katoi - Chief Chetambea location
6. Samuel Kisuya - Chief Muchi location
7. Annet N. Makale - Assistant chief Mitukuyu sub-location
8. Alex Mukwei - Assistant chief Mihuu sub-location
9. Other Attendants as listed on the Attendance List (Appendix 1)

6.4. Meeting Objectives

The objectives of the meeting were introduced as follows;

a) To sensitize the community within the Project area on the proposed NZOIA II Hydropower plant.
b) To discuss with the Project area community on possible impacts of the proposed Hydropower project
c) To build consensus with the project area community about the benefits of the proposed Project

The agenda of the meeting and presented as follows:

- Introduction
- Presentation of the Proposed Project
- Discussion
- Introduction to questionnaire
- Closing prayer
- Closure

6.5. Presentation of the proposed 20MW SHP

The presentation included the chronology of the project since its conception, during the land purchase, the sensitization of the Project to the area community which was conducted two weeks prior to the public consultation meeting.

The presentation of the proposed small hydropower project 20.0 MW was done in three phases namely;

- The background and feasibility study findings that led to need of a hydropower station in the area
- Then he explained in details the proposed hydropower project plan and design
- Presentation of the construction details of the 20MW small hydropower project (SHP)

- The Environmental and social impact of the proposed Hydropower with emphasize that SHP are preferable due to their low negative impacts
- The GoK through Ministry of Energy is promoting the construction of SHPP across the country
- The western region having lowest electrical power coverage in the country despite its potential in agricultural (sugar industry) paper (Webuye), tourism (cottages), education, etc.

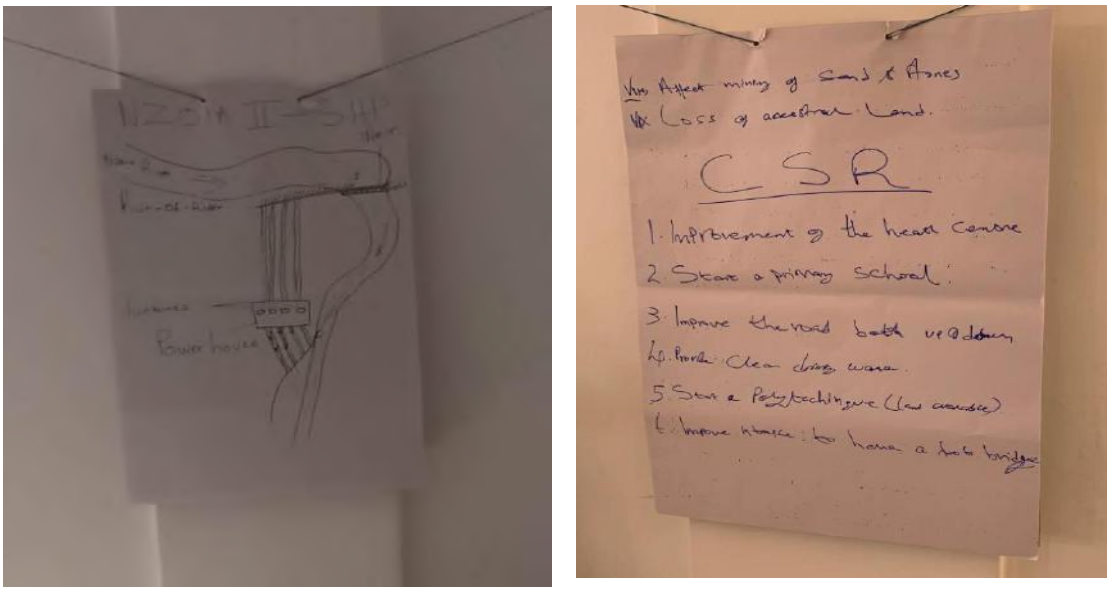

Figure 6.1-Photos showing part of the presentation

Figure 6.2-Photos showing attendees follow the presentation

6.6. Discussion

After the project presentation the meeting was open to discussion and the following Project

impacts were suggested by the participants:

i) The community gave the following as **Positive Impacts:**

- Project will offer employment opportunities to some member of the community
- Power will be available to their homes
- The project will open the economy of the area
- The project will improve security in the area
- People will start small industries
- Improvement of infrastructure of the area
- Project will improve quality of drinking water
- Agricultural sector will improve
- Businesses will grow in the area
- The project will act as tool bank for women and youth
- The hydropower will attract tourists
- The hydropower will act as educational site
- Technology of the area will improve
- The culture will be advertised nationally and internationally
- The project will enhance proper utilization of natural resources in the area

ii) The community gave the following as possible Hydropower Project **Negative Impacts**:

- People will be restricted from getting to project area
- There will be pollution during construction
- The project may influence availability of drinking water
- Ecosystem of the area may depreciate
- Project will affect mining of sand and stones

iii) When probed what would the community request the project to support the community in. The community suggested the following as possible Community Social Responsibility (**CSR)** projects for consideration by the Project Proponents in that order:

- Upgrading of Maraka dispensary
- Building a primary school
- Upgrade the both roads heading to the site

- Start a polytechnic (land is available)
- Design the weir to act as a foot bridgeLighting the area to imp rove security

Figure 6.3-Photos showing participants contribute during the discussion

iv) Introduction of the Questionnaire

The questionnaire was introduced to the participants and they were explained random sampling of the community to fill the questionnaire will be conducted. Six questionnaires were to be filled in Mihuu location while four questionnaires were to be filled in Maraka location. A sample of the questionnaire is attached in appendix 2

6.7. Conclusion and closing remarks

Samuel Katoi chief Chetambea location while giving his closing remarks on behalf of the administration said that, during the sensitization exercise he advised Mr. Muturi and Mr. Edwin to brief DCC Webuye about the proposed project, which he noted they did. On meeting the DCC he briefed him that the Government supports the proposed project and that chiefs and the assistant chiefs should give the project proponents necessary support which they require. The chief remarked to the community that, project such like the proposed hydropower will bring a good name to the area and that they should be ready to support such

projects in the future.

Figure 6.4- Chief Samuel Katoi giving his closing remarks during the public meeting

The community in unison replied to Mrs Daraja while giving closing remarks on behalf of the community that they support the project and it should start immediately mainly to give employment opportunities especially to the youths.

Figure 6.5-Mrs. Daraja giving closing remarks during the public meeting

Mr. Edwin Shivach while giving closing remarks on behalf of Project Team appreciated the good hospitality given by the community throughout the exercise. Janet Muyekho requested pastor to close with prayer and the meeting ended in an upbeat and cordial atmosphere.

6.8. Public Participation: Questionnaire Analysis Report

6.8.1. Introduction

After the presentation and discussion on the proposed project 18 participants were selected in random and the questionnaire administered to them. The responses have been analyzed and below is the summary of the report. The data gives also the economic and social profiles of the project area community.

The data is interpreted in a descriptive form. This report comprises the analysis, presentation and interpretation of the findings resulting therefrom.

6.8.2. Demographic Data

From the sampled population 100% of the head of house hold are male. The area is mainly inhabited by Luhya mainly the Bukusu and Tachoni sub-tribes with less than 10% from other tribes like kikuyu and Luo. 60% of the population is farmers, 20% businessmen while 20% depend on employment. On religion the area is mainly inhabited by Christians. The minimum members of households are 5 members the maximum 12 members and the average being 8 members.

About 70% of house hold head have gone up to primary education, 10% to secondary education while 20% to college education. The main source of income in the area is farming with about 60%, business 30% and employment 10%. The area community would benefit from employment opportunities the project would create during the three phases of the project: Implementation, operation and decommissioning.

6.8.3. Land and Housing

Land

The table 6-1 below shows how many years the people sampled have stayed in the area.

Table 6.1-showing number of years' people have stayed in the area

No of years lived in the area	Percentage
0-20	50
21-40	20
41-60	20
61-80	10

50% of the population has stayed in the area for about 20years, 20% up to 40years, and 20% for up to 60 years while 10% have stayed for over 60years.The size of land owned in the area can be summarized in table 6-2 as follows;

Table 6.2- showing land size in acreage owned by people in the area

Land size (acreage)	Percentage
<1	30
1-5	60
6-10	10

30% of the population has less than 1 acre, 60% has over 1acre but less than 5 acres while 10% owns between 6acres and 10acres. Acquisition of the land in the area is by 70% inheritance and 30 % purchasing. The landownership is freehold and thus landowners have right to sell or buy the land and thus it is attractive for investors to acquire land for long-term investment through negotiations with the landowners and easy to relocate those who have sold land for investments to buy land within the area community. This entails minimum social disruption for those who sell buy purchase land within the community.

Housing

The main house typology is 80% semi-permanent and 20% permanent. The housing type reflects the socio-economic profile of the area community which can be said is average rural community in Kenya based on the type of houses.

6.8.4. Water Source

The main source of water is 90% from river Nzoia while 10% get water from the tap. The water from the river is not treated but people from the area treat it by using chemicals mainly the water guard. The proposed project will not impact negatively on the water quality in the river. Neither the project will impact negatively on the flora and fauna life in the river. The proposed abstraction will divert on the flood water and during the normal flow and flood the environmental flow about $10m^3/s$ will remain in the river at all times.

6.8.5. Social Amenities

The distance moved to arrive to get to social amenities can be summarized as follows; 50% of the people in the area move up to 5km to get to a shopping centre while 50% move less than 1km to get to the shopping centre. 70% of the population move less than 1km to get to a health centre while 30% move up to 5 km to get to health centre. To get to a public hospital 10% of the population move to about 5km while 90% move to about 10km. Private hospital is a distance far with 50% of the population moving between 6km and 10km, 20% between 11km and 15km while 30% move between 16km and 20km. To get to a social premise 20% of the population move between 1km and 5km while 80% move between 6km and 10km. To get to a playing field 50% of the population move between 1km and 5km while 50% move

between 6and 10km. Thus the social amenities are fairly distributed with reasonable distances to access them.

6.8.6. Agricultural Production

Crop Production

The main cash crop in the area is sugarcane with about 10% of the population doing sugar farming. The price of sugar cane per 1 ton is about Ksh. 3200. Maize is grown for subsistence but the farmers sell the excess. From the data, maize production can be summarized as follows; those who produce less than 1 bag 10%, between 1bag and 10 bags 20%, between 10 bags and 20 bags 50%, 10% of the population produce more than 50 bags while 10% do not plant maize. The average price of maize per 90kgs bag is Ksh. 2500. 50% of the farmers' plant millet for sale at about Ksh. 200 per 2kg. 90% of the farmers' plant beans for subsistence but they sell the excess. 80% of farmers' plant bananas for both sale and subsistence. 80% of the farmers' plant potatoes for subsistence. The other food crops grown for subsistence are vegetables by about 80% of the farmers', cassava 20% of the farmers and sorghum by about 20% of the farmers.

The main fruits grown in the study area are mangoes by about 30% of the farmers, pawpaw by about 20% of the population, oranges by about %10 of the population, guava by 30% of the farmers, avocadoes by 20% of the farmers and about 10% of the farmers' plant passion fruits. The area community food production is good as evidenced by community seemingly good health. The area is agriculturally productive and rainfall well distributed during the year and the soils in the area are well drained deep soils ideal for food crops.

Livestock Production

60% of the population keeps cows for milk production for domestic use. Of the sampled population 67% just have one cow and 33% have more than one cow. 20% of the population keeps bull for farming. 40% keeps goat for milk production while 60% do not have goats. The number of goats per farmer rage from1to 6 goats with an average of 3goats per farmer. 20% of the farmers have kept sheep for wool production and mutton.

80% of the population has poultry mainly for egg production ranging from 1 to 40 in number with an average of 12. Poultry in the area are mainly; chicken and ducks.

6.8.7. Public Health

90 % of the population are seasonally affected by malaria, 50% are affected by typhoid. 30% occasionally suffer from eye infection while and 30% seasonally suffer from pneumonia .10% of the children suffer seasonally from measles. 20% occasionally suffer from skin diseases. 60% of the population go to dispensary when they are sick while 40% go to the

hospital. 40% move less than 1km to get to a health facility, 30% move between 1km and 5kms while 30% move between 5kms and 10kms. The data collected reflect area community affected by diseases associated with environmental issues like climate altitude. Provision of health Clinic rated high in the community list of proposed CSR projects.

6.8.8. Energy

10% of the study area is covered by grid power while 90% of the area has no grid power.10% of the population has connected electricity to their homes. 70% the population have not connected the power because the area has no grid power while 30% have not connected because the cost of connecting power is very high.

Those with electricity use it for lighting, charging phones and powering electronics. Of the sampled population 50 % use solar for lighting, charging phones and powering electronics. 20% use kerosene for lighting. 70% use charcoal and firewood for cooking, 20% use charcoal only for cooking 10% use firewood only for cooking.

The main challenges of accessing the energy sources are: lack of trees due to deforestation as population has greatly increased, during rain seasons solar energy is not enough and there are increased instances of power interruption.

People in the area are suggesting planting of trees and connecting the area with electricity as the possible solutions of accessing reliable sources of energy sources.

The data confirms low electricity coverage in the area and thus support for the development of the SHPP.

6.8.9. Perceptions About the Proposed Project

On positive effects 60% of the population believes the project will create employment to the locals, 30% believe roads will improve when the project starts, 30 % say the security of the area will improve, 10% believe the economy of the area will improve and 10% believe education of the area will improve.

On negatively effects 30% of the population is concerned that those moved from the project area will lose their native land while 30% believe they will be restricted from grazing the project area.

The population believe water quality will not be affected by the hydropower project. 50% of the population believes the project will facilitate growth of a vibrant health system. The greatest concern by the sampled population is that the project will cause displacement of people near it and they believe this can be addressed by compensating whoever can be displaced.

The positive changes that have taken place in the area for the last 30 years include;

construction of a health centre, tarmacking of road and construction of a flyover, construction of a bakery and a number of the residents have built permanent houses

Some negative changes that have taken place in the area for the last 30years include; deforestation due to increase in population, flooding because of ploughing near the river, mining of rocks and sand leading to erosion and increase of criminality leading to poor security

6.8.10. General Project Impacts

The possible positive impacts given by the sampled residents are: improvement of health sector, growing of education and educational institutions, improvement of security of the area, the culture of the area will be promoted national and internationally, the hydropower will act as educational and tourist site and the project will create employment during construction and during operation.

The possible negative impacts given by the sampled population include; dangers associated with high voltage cables, dropping of school to seek for cheap labour and the natural environment will depreciate.

The possible proposed Corporate Social Responsibilities (CSR) includes:

I. Provision of safe drinking water
II. Upgrading of primary and secondary school
III. Upgrading and equipping of health facility
IV. Improvement of access roads to the site
V. Promotion of vocational education

100% of the sampled population supports the project. One of the questionnaires has been attached in Appendix

POTENTIAL ENVIRONMENTAL IMPACT AND MITIGATION

7.1. Small Hydropower Plants

Small hydropower plants (SHP) have many advantages against the massive hydropower stations. Usually, the small hydropower plants are run-of-the-river type hydropower stations. Therefore, there is no reservoir to store the water, which has huge environmental and social impacts including the need to displace large populations to make room for the reservoir and dam area and to resettle a large number of displaced people. Unlike the massive reservoirs hydropower plants, therefore, the damage to the biodiversity in the natural environment in run-of-the-river type hydropower station is relatively minimal. Nonetheless the SHP have concerns, though to a relatively smaller scale compared to other power plants (wind, geothermal, thermal plants) which include:

a) Habitat deterioration,
b) Fish and wildlife passage,
c) Environmental flow
d) High-voltage power lines,
e) Wastes,
f) Dust and noise,
g) Rehabilitation and restoration,
h) Visual pollution, among others, and need mitigated to minimize the negative impacts of the SHP.

During the public participation workshop hosted for the project the area community and the area county and Government leaders and community elders the participants in addition raised both positive and negative impacts likely to be associated with the implementation of the proposed SHP plant. The negative environmental impacts cited are: There will be pollution during construction; the project may influence availability of drinking water; and. ecosystem of the area may depreciate

These and other concerns must be mitigated during the three project cycles of construction, operation and decommissioning.

7.2. Potential Impacts and their significance

7.2.1. Destruction of Existing Vegetation

The site for the Nzoia II SHP is covered with scattered shrubs, trees and low bushy vegetation. The upper zone covered with grass-lands, slope bush, lower zone grass-lands and river riparian in woodlands. The trees have been cut down and used in charcoal burning

leaving bare huge boulders of rock, which are the main characteristic feature of the land for Nzoia III, exposed. The snapshot below depicts the status of the vegetation at the site of the Nzoia II SHP.

Figure 7.1- Site for the proposed SHP Plant Nzoia II.

Destruction of vegetation will include in the form of habitat degradation, fragmentation, loss or alteration mainly caused by such factors as tree cut, excavation, fill areas, road construction, blasting, and construction of water storage systems like weir and regulator, pool or lakes, construction of supply diversion canals, headrace culvert excavations, loss of riparian zone and destruction of wetlands. The area to be cleared include the powerhouse (turbines and generators) area and the transformer yard, the diversion canal (60 m long), 4mx4m0 the area for camp for workers, office building, godown for material stock, workshop, construction of road, security boundary walls at camp areas, security post, etc. and storage area.

Mitigation measures

Clearance of part of the vegetation (mainly grass and shrubs and trees) at the SHP plant area, at the access road area, camp for workers and diversion cannels to pave way for construction will be inevitable. However, the project proponent will ensure proper demarcation of the

project area to be affected by the construction works. This will aim at ensuring that any disturbance to flora is restricted to the actual project area (which is small) and avoid spill-over effects to the neighbouring areas. There will be strict control of construction vehicles to ensure that they operate only within the area to be disturbed by access routes and other works. Another important measure aimed at reducing disturbance of vegetation in the proposed project area will be preservation of individual trees within the site. The civil works are proposed to be constructed on riverbed and right banks. Adequate compensatory afforestation shall be carried out and all efforts shall be made during detailed designing of project components to avoid clearing of the existing trees as much as possible. The proponent will plant trees and grass in the disturbed areas through implementation of a well-designed landscaping Programme.

7.2.2. Fish and wildlife passage

The construction of a weir across the river will hinder the free movement of fish and wildlife downstream and upstream of the river. In addition, fish and wildlife may enter the channel diverting the water into the turbines. It is essential that ease be maintained in wild animals' movement including fish.

Mitigation Measures

The weir constructed across the river on the left bank will be the overflow weir and this will provide passage for the fish and other wildlife in the river. However, the passage below the overflow weir is obstructed. The project Proponent will consider construction of fish-ways or fish ladders for fish migration and movement, and constructions like overpass, underpass, culvert or bridge for other wildlife species is necessary. In addition, appropriate filter systems "fish-friendly" turbines should be used in order to prevent fish and other water organisms from being harmed by getting into the water to be used in small hydropower plants.

7.2.3. Environmental Flow

The Water Resources Authority requires Environmental flow be maintained in the river at all times to safeguard the ecological life in the river of fauna and flora. The Q95 flow value currently represents the Reserve, i.e., that quantity and quality of water required to satisfy basic human needs for all people who are or may be supplied from the water resource, and, for the protection of aquatic ecosystems in order to secure ecologically sustainable development. Reserve flow is defined as the equivalent to the Q95 value based on the naturalized daily discharge data at a gauging station where the Q95 represents the flow that is equaled or exceeded 95% of the time.

From the flow duration, the Q95 works out at 10.03m3 per second. This is the flow that

should be passing via the natural channel (overflow weir) away from the intake works at all times to safeguard ecological concerns between the abstraction point and the downstream receiving waters after the power operations. During the public participation workshop, the stakeholders raised a concern that the proposed SHP plant might influence availability of drinking water

Mitigation Measures

The project Proponent will ensure that the Environmental flow Q95 equaling to 10.03 m3/s is released as per the Law. This the Proponent will ensure by construction of an overflow weir on the left bank of the river. In addition the Proponent will undertake the following other measures: That the proposed mini-hydropower stations planned in the river be operated in a synchronized manner to safeguard environmental integrity; That the project should install water measuring and controlling devices to ensure only the authorized water volume is abstracted; That the project Proponent shall implements water conservation measures and riparian river management as guided by WRA to safeguard water quality of receiving waters. The Environmental Flow reserve addresses the concern by the project area community that 'the project may influence availability of drinking water'. The Project Proponents will design and operate the facility efficiently to avoid water wastage and water pollution.

7.2.4. Dust and Noise

The increased traffic will create noise and dust as well from the construction works such as excavation, filling, cutting and blasting. Dust and particulate emissions will occur during the site clearance, excavation and spreading of the topsoil during construction of the access road to the site, workers camp, the generator house and turbines area and the transformer yard. Gas and exhaust emissions will be generated by the transportation vehicles, construction plant and equipment during the construction phase of proposed power project and the decommissioning phase.

There is possibility of suspended and settleable particles affecting the site workers and even neighbours' health, it is minimal given the construction method of minimum excavation and nil cart away of soil. Motor vehicles that will be used to ferry construction materials would cause air quality impact by emitting pollutants through exhaust emissions.

The construction works of the proposed wind power project is likely to be a noisy operation especially from the moving construction plant and equipment. The workers at the construction-site will inevitably generate some noise as they communicating to one another. This will be a potential source of disturbance at the site and surrounding neighborhoods of

the proposed SHP project. A number of construction operations will be undertaken at the hydropower plant and will be expected to produce noise. These include bulldozers and excavators, concrete mixers making concrete for construction of the generator and turbine house, weir and diversion canals directing water into the turbines, construction machinery for the access road and trucks delivering construction materials to site and Hydropower plant equipment. Noise from the operation during power generation will be minimal is not expected to be an environmental issue as the project is located in a designated area away from residential area. The noise pollution from the project is not considered significant.

The decommissioning works of the proposed hydropower project is like the construction phase likely to be a noisy operation especially from the moving decommissioning/construction plant and equipment. Noise will be generated by the required cranes and trucks to take the turbines down and generator electrical and mechanical equipment and transport the equipment off site.

Mitigation measures

In order to protect the air quality on the construction area, the dust concentration can be effectively reduced and controlled by strictly following the wet dust removal operation in the construction. The automatic cement injection pump pipe can be used to reduce air pollution and cement waste by saving, no noise, no dust pollution and reliable operation.

Controlling dust and noise emissions that are likely to take place during construction, operation and decommissioning phase of the proposed SHP plant will be undertaken. It is recommended that a standard set of feasible dust control measures be implemented for all construction activities. Emissions of other contaminants (NO_x, CO_2, SO_x, and diesel related PM_{10}) that would occur in the exhaust from heavy equipment are also included. The project proponent is committed to implementing measures that shall reduce potential of air quality impacts associated with construction. During construction, any stockpiles of earth, or opened areas should be covered and /or watered during dry or windy conditions to reduce dust emissions.

During construction, the access road working areas will be watered to keep dust levels down. Construction trucks removing soil from the site, delivering sand and cement to the site should be covered to prevent material being blown by wind into the surrounding areas. In addition, dust masks should be provided to all personnel in areas prone to dust emissions throughout the period of construction, particularly those working in concrete mixing areas and onsite access road construction. The working machinery and equipment will be kept in good working condition in order to ensure minimum emissions including CO, NO_X, SO_X and

suspended particulate matter.

The Project Proponent shall put in place several measures that will mitigate noise pollution arising during the construction and decommissioning phase. The following noise-suppression techniques will be employed to minimize the impact of temporary construction noise at the project site:

1. Use of quiet equipment (i.e., equipment designed with noise control elements), where appropriate.
2. Limit vehicles to a minimum idling time and observe a common-sense approach to vehicle use, and encourage drivers to switch off vehicle engines whenever possible
3. Compliance with the recently issued Noise and Vibration Regulations of 2009 is expected at all the phases of the project.
4. All construction work to be done during the day.
5. Movement of heavy plant transporting construction materials and other SHP plant equipment will be limited to off-peak hours between 10:00 am and 4:00 pm. Night delivery will not be allowed to prevent noise pollution to the residents of the neighboring community. The onsite access road will be compacted and watered to reduce dust.
6. High levels of dust concentration resulting from demolition or dismantling works will be minimized by:
7. Watering all active demolition areas as and when necessary to lay dust.
8. Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.

The Project Proponent will ensure noise of constructing machine is not allowed to exceed the noise standard of motor vehicle the regular shift rotation system should be implemented in order to avoid workers' continuous exposure to noise.

7.2.5. Wastes and Hazardous Materials

The negative environmental effects SHP plant may include solid and liquid wastes such as glass, nylon, tin, paper, waste water from toilet, and kitchen sink and oil and fuel used in machines and other equipment. In addition, polluted water during the weir and diversion channel constructions may be discharged into rivers without any treatment.

The generation and discharge of wastewater of any type should be managed through a combination of:

- Water use efficiency to reduce the amount of wastewater generation;

- Process modification, including waste minimization, and reducing the use of hazardous materials to reduce the load of pollutants requiring treatment; and

At the construction phase of the proposed SHP plant project, solid waste will be generated. These include packaging materials, paper, plastics, scrap metal and timber remain among others. Industrial wastes that would be generated during the construction phase would include minor amounts of paints and coatings and spent solvents, oils spills associated with the site plant and equipment. Some amounts of solid wastes generated during the operation of the project could consist of drums, used oils, papers, plastics, glass, metal, textile and inorganic wastes. Sanitation wastes will also be generated from washing and cleaning as well as from the toilets. Industrial wastes associated with equipment maintenance may also include solvents and cleaning agents. Judicious choice of solvents should prevent such wastes from meeting the state regulatory definitions of hazardous wastes. Demolition of the proposed SHP plant project and other related infrastructure will result in generation of solid waste. The waste will contain materials used in construction including concrete, metal, drywall, wood, glass, paints, adhesives, sealants and fasteners. The plant and machinery (trucks, cranes, forklifts, etc.) on-site may be containing moving parts which will require continuous lubrication to minimize the usual corrosion or wear and tear. Likewise, moving vehicles on-site may require oil change.

Dumping of waste around the site would affect the aesthetic status of the area and would have direct effect to the surrounding community. Disposal of the same solid wastes off-site could also be a social inconvenience if not handled appropriately and in the designated locations for such materials. The off-site effects could be aesthetic, pest breeding, pollution of physical environment, invasion of scavengers and informal recycling communities. Minor amounts of wastes associated with the onsite maintenance of off-road construction equipment would also be generated. However, it is anticipated that such on-site maintenance activity would be limited to what is immediately necessary to keep the equipment in running condition. Routine periodic maintenance, such as oil, coolant, and filter changes, is expected to be performed off- site.

a) Waste Generation during Operation Phase

These wastes should be handled as appropriate. Such wastes can be injurious to the environment. Some of these waste materials especially the plastic/polythene are not biodegradable hence may cause long-term injurious effects to the environment.

In the event of the wholesale failure of a turbine drive train component, that component is expected to be removed and transported from the site for repair or disposal. No major

rebuilding of components is expected to occur on-site.

b) Waste Generation during decommissioning phase

Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment.

c) Oil Spills

There may be likelihood of oil spillage through accidents or improper handling of oil. Such oil spillage could contaminate soil and water. However, the quantities of oil used by machinery during construction and by the turbines during operations are extremely small and in practice limited to periodic oil changes to the equipment.

Mitigation Measures

The Proponent is committed to ensuring that construction materials left over at the end of construction will be used in other projects rather than being disposed off. In addition, damaged or wasted construction materials will be recovered for refurbishing and used in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or home owners. The materials that can be recovered and reused should be segregated. The rest should be disposed of at designated solid waste disposal sites. A qualified contractor will be contracted to handle decommissioning and disposal.

The Proponent of the proposed SHP plant will ensure that there are sanitary facilities to cater for workers and visitors to the project site. Waste from these facilities will be managed appropriately through provision of onsite sanitation facilities. It will also be important to ensure that toilets are kept clean and properly maintained. The wastewater discharged will to conform to discharge guidelines set out by NEMA. The SHP plant process will not produce any sewage.

The Proponent of the proposed SHP plant will control the dangers of oil spills during construction by maintaining the machinery in specific areas designed for this purpose.

The Proponent is committed to ensuring that construction materials left over at the end of construction will be used in other projects rather than being disposed off. In addition, damaged or wasted construction materials will be recovered for refurbishing and use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents or home owners.

For solid wastes generated during construction, Project Proponent, will provide special spoil

disposal sites must be set up and retaining works built to avoid new soil erosion. For the same reason, a retaining wall also should be set up around the selected spoil disposal area. The proposed mitigation measures address the negative impact raised during the public participation workshop that --- 'there will be pollution during construction'.

After the completion of the project construction, the temporary occupation land and damage earth's surface and vegetation will be repaired and restoration, and the weir area, plant area and living (operation management) area should be afforested and beautified.

7.2.6. Water Quality Degradation

Oil spills during construction could introduce contaminants into subsurface as well as surface water. However, the use of oil is limited to minimum quantities (Gearbox oil changes) and these will be disposed of appropriately off-site. The plant itself requires no water beyond the construction phase where water will be required for concrete works, and this will be sourced off from the Nzoia River in a sustainable manner.

The construction facilities will include concrete mixing system, warehouse, comprehensive processing plant, aggregate storage yard. Part of the permanent office and living facilities of the power station can be constructed for temporary use during construction. The air for the rock excavation will be supplied by mobile air compressor and the water will be pumped from the river, and domestic water can be drawn from the nearby pipe.

The construction of the access road to the project site, workers camp, transformer yard, power house for turbines and generator and diversion channel will lead to additional run-off through creation of impervious areas and increased compaction of soils. Impervious areas and compacted soils generally have higher run-off coefficients than natural area, and increased flood peaks are a common occurrence in developed areas.

The sediment flow in original river in the stretch of intake weir to mini hydropower plant (roughly 500m) is significantly blocked due to the head raised canal. The flow in that stretch is very low and therefore (limited to environmental flow (Q95)10.03 m3/s), the sediment flow is negligible. This makes adverse environmental effect on the surrounding and the aquatic life.

Therefore, it is advisable to conduct some water quality analysis for oil and grease for the water release from the turbines.

Mitigation measures

The production and living wastewater and solid waste produced during the construction period will cause negative impact on the water quality near the construction site if all the waste is discharged without processing.

The reservoir site below the normal water level must be cleaned before the reservoir is filled with water. It is necessary to strengthen the monitoring of water quality in reservoirs and remove floating garbage from the reservoir timely during operation. Also, the upstream area needs to seal the mountain forest, in order to prevent soil erosion. Moreover, the Project Proponent will assist the Bungoma and Kagamega County government in strengthening forest protection in the upstream area.

The Project Proponent will adopt the physical methods commonly used in hydropower engineering should be adopted to treat the production wastewater, and the treatment rate should reach 80%. Simple dry toilets and septic tanks should be set in the construction and living areas respectively to collect domestic wastewater. After regular disinfection and treatment, they are transported to the designated domestic waste disposal site for centralized treatment. Direct discharge into the river channel is strictly prohibited.

The river has a good water quality and the reservoir site will be cleaned before water storage, the reservoir water quality will have no significant impact if there is no new source of pollution.

No waste water or gas will be discharged during the operation. Due to the advanced automatic control system adopted in the power station, there are only two or three managers in the plant during operation. And domestic sewage will not be discharged into Nzoia River, so the influence of domestic sewage on Nzoia River water quality can be neglected. In addition, the pressure oil system of Nzoia II HPP is in a fully sealed state, with small unit capacity and limited oil consumption. Even during the maintenance period, the pressure oil will be drained and discharged into the oil storage barrel, and then processed, so that the oil will not leak out and affect the environment.

Thus, the increased run-off that could cause soil erosion especially on the steep slopes as evidenced in the project area will be managed through the design and construction of appropriate drainage and run-off management so as to avoid erosion.

The reservoir of Nzoia II HPP has a smaller regulating capacity. There is one turbine have to operation continuously at least, so it will not change the downstream river flow or water temperature, and it will not cause river setting off. However, sediment trapped in the screens of the head raised canal is released back to the downstream river. This helps to regain the nutrients flow from upstream to downstream.

7.2.7. High-voltage power lines

The power from the SHP will be through construction of an approximately 3.3 km, 33kV overhead double circuit line to Webuye 132/33kV Substation and an establishment of an

additional two 33kV bays at the Substation to accommodate the incoming feeders. The negative effects of high- voltage power lines on birds are possible creating a danger for birds, jeopardizing public health and causing aesthetic deformations in the natural ecosystems. The new transmission line could encroach on people's land.

Mitigation Measures

The proposed solution is that the high-voltage lines will pass at least 300 m away from the residential areas with a concern about the integrity of the landscape and aesthetic view. The route for the proposed transmission line is proposed will be along the riparian way leave along the river bank and thus will not affect the project area community land significantly.

POTENTIAL SOCIAL–ECONOMIC IMPACT

8.1. Socio-economics

The Counties of Bungoma/Kakamega economies of the larger SHP plant regions is largely rural and more than 90% of the population earns its living from agriculture and livestock. The farms are privately owned and on average 1– 3 hectares. However, large commercial farms with an average of 50–100 hectares or more characterize such districts as Trans Nzoia and Uasin Gishu. The main food crops include maize, sorghum, millet, bananas, groundnuts, beans, potatoes, and cassava while the cash crops consist of coffee, sugar cane, tea, wheat, rice, sunflower and horticultural crops. Dairy farming is also practiced together with traditional livestock keeping. The River Basin is of great economic importance at local as well as national levels especially in such sectors as agriculture, tourism, fishing, forestry, mining and transport. It is also the main source of water for domestic (rural and urban water supply), agriculture and commercial sectors, as well as for very important industrial establishments in Western Kenya, namely Pan Paper Mills, Nzoia Sugar Company, Mumias Sugar Company, and West Kenya Sugar. In addition, there are numerous minor sugar factories (jageries), coffee roasters, wood processors and tea factories. Other factories are found in Eldoret, Kitale and Kapsabet. The local communities provide labor to these industries from which they obtain income to supplement those from their subsistence activities. The main challenges in the basin include soil erosion and sedimentation, deforestation, flooding, wetland degradation, pollution and solid waste, river bank cultivation, sand harvesting, brick making, human-wildlife conflict and poorly developed infrastructure.

The micro socio-economic profile of the project area community is presented in Chapter Six. The socio-economic information/data was collected during the public participation workshop and by administration of questionnaires designed to capture the socio-cultural-economic data/information and subsequently analyzed.

A brief summary of the socio-economic profile of the SHP plant area community is presented here. The socio-economic profile of the project area community mirrors the general socio-economic profile of the larger Bungoma and Kakamega Kenya's rural area counties presented above. The economic activities within the SHP Plant area are composed of small-scale agricultural activities of growing of crops for subsistence farming and for sale which such include maize, beans, bananas, potatoes, cabbages, cassava, rice, millet, sorghum, and sugarcane, etc., other crops include mangoes, pawpaw, oranges, avocadoes and passion fruits.

The area community food production is good as evidenced by community seemingly good health. The area is agriculturally productive and rainfall well distributed during the year and the soils in the area are well drained deep soils ideal for food crops.

Livestock rearing is practiced where farmers keep cows for milk production for domestic use, some farmers keep bull for plough-farming. Goats are also kept for milk production and some the farmers have kept sheep for wool production and mutton. A large population in the project area community keep poultry (range) mainly for egg production and sale for meat and the common poultry is chicken and ducks.

A large population are farmers about 60% of the population sampled, 20% businessmen while 20% depend on employment.

The landownership is freehold and thus landowners have right to sell or buy the land and thus it is attractive for investors to acquire land for long-term investment through negotiations with the landowners and easy to relocate those who have sold land for investments to buy land within the area community. This entails minimum social disruption for those who sell buy purchase land within the community.

The majority houses are typology semi-permanent (clay soil plastered walls roofed with iron sheets) and permanent houses. The housing type reflects the socio-economic profile of the area community which can be said is average rural community in Kenya based on the type of houses.

The main majority of households draw water directly from the Nzoia river and only a small number get water from the tap. The water from the river is not treated but people from the area treat it by using chemicals mainly the water guard.

The social amenities within reasonable reach in the proposed SHP plant area include, shopping centres, schools, hotels, health centres, private hospitals, social hall, etc. Webuye town is a short distance from the proposed SHP project. The Webuye town is a vibrant town and the A104 Kakamega –Bungoma road passes near the Webuye town. Thus, the social amenities are fairly distributed with reasonable distances to access them.

On public health the population are seasonally affected by diseases majority malaria followed by typhoid, eye infection while some suffer from pneumonia. A small proportion of children suffer seasonally from measles and some occasionally suffer from skin diseases.

The source of energy for lighting and cooking, only a small percentage (about 10 %) of the study area is covered by grid power while 90% of the area has no grid power. Only about 10% of the population has connected electricity to their homes. 70% the population have not connected the power because the area has no grid power while 30% have not connected

because the cost of connecting power is very high.

Those with grid power use it for lighting, charging phones and powering electronics. Other sources of power include, solar for lighting, charging phones and powering electronics. A number of households use kerosene for lighting and majority use charcoal and firewood for cooking.

Charcoal burning is big challenge due to deforestation as population has greatly increased, during rain seasons solar energy is not enough and there are increased instances of power interruption. An example of deforestation is the felling of trees at the site of proposed SHP Plant (Figure 7.1). This was even after the project proponent acquired the land. Charcoal burning is also due to poverty in the area and also due to its demand for cooking and heating.

The socio-economic impacts of the proposed SHP Plant are discussed here below. During the Public Participation Workshop, the participant listed a number of positive impacts the proposed project would bring within the area. These are presented in Chapter 6. The social-economic impacts of the proposed SHP Plant are discussed here below and the appropriate mitigation measures presented.

8.2. Impacts and their Significance

8.2.1. Increased Population around the Project Area

The construction phase of the proposed project will lead to the establishment of businesses especially the service industry within the proposed project area. The area will attract people from other parts of the country who will be seeking business opportunities there.

i. Increased Water Demand

The proposed project does not require any water however increases in population will cause increased water demand in the area.

ii. Increased Pressure on land and Infrastructure

The proposed project will result in increased pressure on existing infrastructure such as roads (increased traffic). This is because of increased population in the area as well as movement of people working in or visiting the project area. While there will be an increase of vehicular traffic in the project area this is not expected to be significant. Increased human population will increase pressure on land and housing.

iii. Increase in insecurity

During construction and operation of the SHP plant there will be an increase in number of people settling near the project area. With the increase in population, it is expected that the number of crimes will increase leading to insecurity in the area.

Mitigation Measures

a. Minimization of increased Water Demand

The proponent of the proposed SHP plant shall ensure that during construction water is used efficiently at the site by sensitizing construction staff to avoid irresponsible water use. The water for use in the construction will be drawn directly from the river. The water for construction workers at the site will be obtained from the nearby Webuye Water Treatment using water bowsers. Water storage tanks will be constructed for water storage for use by the workers for the SHP plant.

b. Security

The Project Proponent will provide adequate lighting inside and outside the living areas. Security will be enhanced at the workers camp and material site. Security personnel will also be employed to guard the SHP Plant entire site. The project site will also be well fenced.

c. Pressure on roads and other infrastructure

The project Proponent will upgrade the two access roads leading to the proposed SHP Plant. During the rainy season the access roads to the project site are not motorable.

8.2.2. Cultural Heritage

Luhya mainly the Bukusu mainly inhabits the project area community area and Tachoni sub-tribes with lesser numbers of other tribes like kikuyu and Luo. Although the nearby Webuye Town is fairly vibrant with all types of people the SHP will no doubt attract more diverse cultures of people especially during the construction phase and decommissioning phases of the SHP plant in search of employment opportunities and other trades. There are no mineral resources or cultural relics or historic sites found in the project area.

Mitigation Measures

There will need to create and raise awareness among the local community on potential impacts of interacting with the labour force including health problems like HIV/AIDs, and now the dreaded Covid -19 virus. The project Proponent will ensure adherence to the Ministry of Health Protocols at all times against the Covid-19 and its related infections as laid down from time to time. The Project Proponent will also prioritize employment and engagement of the local populace through their leaders.

8.2.3. Land Acquisition for SHP Plant

According to the construction layout plan, the land along weir, plant area, office area, and living quarters to the river side shall be all requisitioned. The site plan for the land earmarked for the siting of the SHP Plant is shown in Figure 7.1. The land is owned by private individuals and the activity on the land is generally charcoal burning activity and grazing for livestock. The land is not suitable for growing of crops as well as construction of houses as it is quite steep slope with and rock outcrop. The individuals who own land have inherited the land and many had sold the land to third parties and relocated elsewhere. The Project Proponent agreed with the land owners on the purchase price for the land and compensation for properties including trees, food crops buildings.

Mitigation

The land owners agreed to sell the land for siting of the SHP Plant as willing sellers and buyers. The land for the sitting of the SHP Plant is unsuitable for agricultural activities, as it is very steep towards the river Nzoia and very rocky and hence the landowners described the project as Godsend as it enabled them to sell the land and buy suitable agricultural land elsewhere.

The proponent of the SHP plant entered into negotiations with individual land owners three who were family members and two other individuals who had bought the land from the three family members earlier. The five individuals agreed to sell the land to the project Proponents whose total acreages was…… The landowners were happy and satisfied with the purchase price for the land and compensation for their land, crops, trees, and building erected on the land. The individuals who sold the land bought land nearby within the same area and thus they did not suffer any social disruption occasioned by them moving from the project land to new locations. The individuals are within the same community, within the same social and economic amenities in Webuye Town including schools, health centres and hospitals, shopping centres and markets, worship places and sports facilities, social halls and similar livestock and crops farming and same physical and environmental features (Nzoia River) and infrastructure (roads, electricity).

8.2.4. Sand Harvesting Activity

Within the area downstream of the of the proposed weir location, the community were mining building sand from the river and thus the construction of the SHP Plant in the area will disrupt their sand mining activity. Besides the erection of the weir will trap the sand upstream of the weir rather being than deposited at the present area in the river without the weir construction. The community expressed this concern during the Public Participation

Workshop and they were assured that the Project Proponent would address this negative impact arising after the project implementation.

Mitigation Measures

It has been observed that there are many sands mining sites downstream of the site for the location of SHP Plant and thus it is possible for these mining the sand at the present site to relocate downstream of the present site as there are some other sand mining sites downstream of the SHP plant area. The construction of the weir across the river will results to trapping of sand upstream of the weir, but the sand will be periodically flushed downstream of the weir and thus available for mining activity by the community. The SHP Plant final design will ensure that sand flushing facilities are included.

8.2.5. Public Health

On public health the population is seasonally affected by diseases majority malaria followed by typhoid, eye infection while some suffer from pneumonia. A small proportion of children suffer seasonally from measles and some occasionally suffer from skin diseases. In addition, the Project may attract people from other areas in such of employment opportunities. This may cause increased infections of lifestyle diseases such as HIV/AIDs and other sexually transmitted infections.

Mitigation Measures

The Project Proponent will mount public awareness and sensitization campaigns to the project area community and site workers against dangers of diseases such as HIV/AIDs, Covid-19, and other sexually transmitted infections which might be contracted from people coming from diverse cultures and other localities in search of employment opportunities or working for the project.

8.3. Positive Impacts

The implementation of the SHP Plant will bring a number of positive economic impacts. The SHP Plant positive impacts far outweighs the negative impacts. The Participants during public participation workshop forum at the end of the Workshop they enthusiastically and overwhelmingly supported the implementation of the Project. The Workshop participants during the open discussion session suggested the project's positive impacts, when implemented, which are listed in Chapter Six. These positive impacts are highlighted here and they include:

- Project will offer employment opportunities to some member of the community
- Power will be available to their homes

- The project will open the economy of the area
- The project will improve security in the area
- People will start small industries
- Improvement of infrastructure of the area
- Project will improve quality of drinking water
- Agricultural sector will improve
- Businesses will grow in the area
- The project will act as tool bank for women and youth
- The hydropower will attract tourists
- The hydropower will act as educational site
- Technology of the area will improve
- The culture will be advertised nationally and internationally
- The project will enhance proper utilization of natural resources in the area

WORKERS AND COMMUNITY HEALTH & SAFETY

9.1. Transport and Traffic

(i) Equipment and Material Transportation Plan

The project's site is located 2km downstream of the Webuye Water Fall in Nzoia River which is also border line between Kagamega and Bungoma County. The Power Plant is located at the suburbs of Webuye town in Bungoma County, the right bank of Nzoia River, approximately 4km from down town of Webuye, 383 km from Nairobi, 864km from Mombasa port.

All the import equipment and material will be delivered to Mombasa port and then transported to the site via road which is around 861km. The detail of the transport is Mombasa-Nairobi-Nakuru-Eldoret-Lwandeti-Project's site. The road from existing highway to the project's site will be about 1.2km long. Besides, other construction material will be purchased from local market and transported by truck.

The port of Mombasa is located on the East Coast of Kenya, South East of Nairobi and is connected by road, a new SGR rail and air. The main highway from Mombasa to Nairobi is the A109. This highway has recently refurbished and is of good quality. It is wide and has ample width to accommodate out of gauge cargo. The total distance from Mombasa to Nairobi is 530kms. The new SGR extends from Nairobi to Naivasha Dry Port and efforts are advanced to refurbish the one metre gauge railway to Kisumu.

The transport of the hydropower plant from Mombasa to Webuye can be through railway or

road and both transport options are available and adequate.

The equipment transported will include the turbines (four in number), the electrical generators, and associated electrical and mechanical equipment listed in Chapter 5. There will also be movement of other project machineries such as cranes, excavators, bulldozers, water dowsers, trucks, etc.

The in-site Transportation there are existing backroad available from A104 National Road to the weir site on both banks presently. An about 300m long of new temporary construction road will be built to weir abutment on both banks, and which can be used as a permanent access road after the completion of the project.

Mitigation measures

Transportation of heavy plant and construction materials and equipment will be confirmed to off-peak hours between 10:00 am and 4:00 pm. Night delivery will not be allowed to reduce noise pollution to the residents of the route adjacent community. The on-site road will be compacted and watered to reduce dust. The contractor will also be required to use well trained and experienced drivers. The contractor will also ensure that vehicle used comply with axle load limits and that vehicle used are adequately maintained to reduce emissions. The vehicle convey from Mombasa to Nairobi should travel at night to avoid traffic congestion. At Nairobi Central Business District, traffic snarl-up can be avoided by using the road by-passes to avoid traffic congestion through the Uhuru Highway Road.

9.2. Worker health and Safety

9.2.1. Potential worker safety issues

The Construction workers especially the unskilled employees may have accidental injuries due to exposure to workplace hazards. Injuries could arise from falls, cuts, blasting of rock, run-over by machinery at site including vehicles, excavators, cranes, trucks, etc.

The Kenya Occupational Health and Safety regulations, specifies that construction safety protocols will be enforced at all times during the construction and erection and operational phases. All contractors will have trained health and safety representatives on-site to ensure all regulations are observed. Health, safety and welfare reports will be produced during the construction period identifying all no compliance issues.

Other issues include diseases spread. To curb the spread of communicable diseases the workers camp will be provided with portable water supply. The camps will be furnished with communal bathrooms and lavatories. The camps will be kept clean daily by a cleaning crew. Sexually Transmitted Diseases including the Sexually Transmitted Diseases (STDs) including other infectious diseases like Covid-19, awareness campaigns will be conducted for

those living in the camps.

9.3.2 Health, Safety and Environment (HSE) Planning

a) Construction of HSE management plan

A construction HSE plan is a management tool used to manage HSE activities associated with the construction of a project. It is a prerequisite for satisfying the project Proponent that the contractor has implemented a management system for the safe operation of construction related activities in a project. The construction HSE plan sets out the HSE management system as well as the resources required to implement it. It includes the minimum requirements for compliance with local HSE laws and regulations in order to prevent injuries to workers, damage to property or the environment. In the absence of relevant legislation, the contractor will ensure compliance with international standards, guidelines and best practices in the safe operation of construction activities associated with the project.

b) Objectives of a construction HSE plan:

The principal objectives of a construction HSE plan include:

- Prevention or limitation of injuries to workers, damage to property or the environment through an emergency preparedness and response plan;
- Prevention of recurring accidents or incidents through a program of root cause analysis;
- Ensuring that safe work practices and procedures are issued and understood by all construction workers;
- Verification through planned audits and reviews that procedures and instructions are complied with fully; and'
- Counselling of construction workers involved in near misses on better safe work practices.

To comply with the principal objectives, the Contractor will implement the following strategies:

- ✓ The HSE goals/objectives of the project will be verified and commented upon in each HSE meeting and a monthly HSE theme relevant to the planned objectives will be issued;
- ✓ Monitoring and control of unsafe practices;
- ✓ Initiate an unsafe act/condition report system for conveying accountability to affected employees including a disciplinary action system for non-compliance;
- ✓ Initiate an HSE recognition and rewards program for good HSE

behaviour among construction workers;

- ✓ Organize HSE competitions to promote interaction of construction workers through direct involvement in routine HSE objectives.

c) HSE organization and responsibilities

HSE is a management responsibility. Subsequent construction management of the proposed project shall form part of the daily responsibility of each member of the Contractor's management team and the sub-contractors' they supervise. The Contractor's organization structure should include several persons who will have routine responsibilities for managing HSE aspects associated with the construction phase of the project. A brief outline of the roles and responsibilities of various employees i.e., managers, engineers, supervisors, sub-contractors, suppliers, employees etc. in HSE management should be presented.

d) HSE performance measurement

The Contractor will be required to develop, rollout and implement an HSE performance measurement system. The measurement system will be used to recalibrate the HSE performance of the project during the construction phase to ensure that there are no injuries to people, damage to property or the environment. Some of the performance measurement metrics that should be considered for tracking include the following lagging and leading indicators:

- No. of fatalities;
- Lost time incident rate (LTIR);
- No. of fire incidents;
- No. of environmental incidents;
- Equipment damage/minor injuries;
- No. of health and hygiene reports;
- No. of HSE meetings conducted;
- No. of HSE inspections undertaken;
- No. of emergency drills conducted;
- No. of HSE training courses conducted

e) HSE interface between contractor and proponent

Throughout the construction phase, there will be an interface between the project Proponent and the Contractor on HSE management. The objectives of this activity are to ensure that:

- o The contractor achieves the same or higher HSE standards than those stipulated by the proponent;

- All HSE related hazards of the construction phase are identified, evaluated and appropriate control measures implemented;
- The contractor understands their obligations with respect to HSE associated with the project;
- HSE performance management arrangements are in place by mutual definition.

The interface on HSE management may be achieved by the Proponent and Contractor through meetings, reviews and audits during the design and construction phases of the project respectively. Some of the meetings may be defined as follows:

- HSE kick-off meeting;
- Weekly HSE progress meetings;
- Ad-hoc HSE meetings called by either the Proponent or the Contractor to discuss specific HSE issues; and
- HSE reviews/inspections undertaken by either the Proponent or the Contractor or both.

9.3.3 Safety Action Plan Design Phase

This section highlights the processes that will be used by the Contractor during the design phase of the project. The processes include general duties, HSE management during the design phase, design reviews and recording.

a) General duties

It will be the general duty of the Contractor's in-house designers to ensure that the design and construction of the proposed project is achieved without HSE risks as far as is practically possible. Hazards associated with the construction and commissioning of the proposed project will be identified during the design phase of the project. Where possible the hazard will be removed or avoided however if this is not possible, appropriate control measures will be incorporated in the design phase.

During the design phase, the Contractor will develop construction operating procedures to ensure the safety of people, maintain integrity of the proposed project against capital and revenue loss, and ensure against damage to the environment. This will be achieved by employing the following tasks:

- Application of correct design standards, cods of practice, policies, procedures, etc.;
- Critical review of the design and construction activities of the project;
- Formal identification of hazards;

- Qualitative/quantitative analysis; and
- Implementation of actions arising from these steps.

b) HSE management

HSE management in the design phase will encompass interactions between the following Contractor's specialists:

- HSE Manager;
- Safety and Environmental specialist; and
- Project designers.

Each of the above disciplines will have specific roles to play in ensuring that the proposed project is designed in compliance with health and safety hazards requirements. Where such hazards cannot be eliminated, a hierarchy of hazard control will be employed to minimize the health and safety hazard exposure to construction workers.

The Contractor while conducting the design will ensure that the designers systematically exercise health and safety issues associated with the design of the project. Any risks identified will be eliminated to ensure that there is no risk to worker injury or property damage. The designers will employ a risk assessment approach to the design of the project. Under this approach if the identified risks cannot be eliminated, sufficient information will be included with the design to alert others on the risks which they cannot reasonably be expected to know about.

c) Design reviews

The safety action plan in the design phase will include both internal and external design reviews. Internal design reviews will be initiated by the contractor's engineering manager and will include verification of all engineering documents before releasing them to the Project Proponent for external reviews. The external design review will be undertaken by the Project Proponent to ensure that the Contractor's project design is adequate and conforms to the terms of the contract health and safety requirements.

d) Recording process

The Contractor will have in place a quality assurance system such as ISO 9001. The Contractor's designers will maintain a record of all design decisions and how health and safety was incorporated into the design.

A health and safety file will be maintained by the Contractor containing the risk control measures that need to be implemented during the construction phase of the project.

9.3. Construction and Installation phase

9.3.1. Safety hazards and critical areas

Prior to commencing construction, the Contractor will identify potential hazards to the safety of personnel associated with construction phase of the project. The list of potential hazards will be updated on-site at regular intervals.

For each hazard identified the Contractor will ensure that there is a safe work procedure that is developed, rolled-out and implemented for the project.

9.3.2. Safety procedures

As an experienced Contractor will be engaged for the execution of the Project, it is envisaged that they will already have safe work procedures developed for similar types of projects. These procedures will be customized for the proposed project and used throughout the construction phase. Examples of construction activities for which safe work procedures are required include:

- ✓ Cranes and lifting equipment operations;
- ✓ Electrical work;
- ✓ Confined space entry;
- ✓ Fire protection and prevention;
- ✓ Emergency response;
- ✓ Permit-to-work;
- ✓ Job safety analysis (JSA);
- ✓ Risk analysis;
- ✓ Root cause analysis;
- ✓ Safety incentive program; and
- ✓ Disciplinary system, etc.

9.3.3. Safety Training

Health and Safety training of workers is required by Kenyan legislation under the Occupational Health and Safety Act, 2007 (OSHA). Additionally, the Contractor will be required to train their sub-contractors on the safe work procedures some of which are identified above. The Contractor needs will identify health and safety training prior to commencement of the construction phase of the project. Health and safety training associated with the project will be extended to all levels of management and workers who may potentially be exposed to health and safety risks during the construction phase of the project. The Contractor for review by appropriate lead agencies and the Proponent will maintain health and Safety training records on-site.

9.3.4. Safety guidelines and rules of operation

The successful Contractor will be required to have a formal Personal Protective Equipment (PPE) program that can be implemented for the proposed project. The PPE program will include instructions for:

- Selection of correct type of PPE based on the hazards at the job site;
- Issuance of PPE;
- Correct use of PPE;
- Inspection and maintenance of PPE; and
- Replacement of worn-out PPE.

In addition to the PPE program, the Contractor will evaluate all risks associated with working at height (1.8m above grade level). For such work, the construction workers will be provided with appropriate safety harnesses or safety nets. All construction vehicles will be fitted with seat belts that operators must wear while working.

The construction-site will contain appropriate signs, signals and barricades that are visible to the workers to protect them from potential hazards. Trenches and other excavation will also be provided with appropriate barricades, signs and signals. Where it is necessary to perform work at night, the Contractor will ensure that their sub-contractors provide sufficient artificial lighting to permit work to be carried out safely, efficiently and satisfactorily. All tools and equipment deployed by the contractor and their sub-contractors shall be free from defects, be in good operating condition and maintained in a safe condition. Any equipment that falls under the Examination of Plant Order under the OSHA shall be inspected by a DOHSS approved person and a certificate issued prior to its use at the construction-site. Some of the tools, equipment and plant expected to be used for the proposed project include:

- Hand and portable power tools;
- Compressed gas cylinders;
- Scaffolds;
- Cranes and lifting equipment;
- Motor vehicles; and
- Ladders.

In addition to the above, the Contractor will develop, rollout and implement the following health and safety rules for the construction-site:

- ✓ Job site transportation;
- ✓ Daily construction plant inspection;
- ✓ Electrical operation;

- ✓ Floor, wall openings and stairway;
- ✓ Excavation and trenching;
- ✓ Steel erection;
- ✓ Confined space entry;
- ✓ Work near pressurized pipelines;
- ✓ Medical services;
- ✓ Fire protection and prevention; and
- ✓ Alcohol and drug abuse.

9.3.5. Occupational health action plan

An occupational health plan is primarily concerned with identification, evaluation and control of environmental health exposure that result from construction processes. The stresses can be physical, chemical, biological and physiological and may cause sickness, impaired health or discomfort to employees.

An Occupational Health plan therefore addresses the above concerns as they apply to the project and to provide cost effective solutions to assure the health and well-being of project employees. The contractor will engage the services of a medical practitioner(s) with skills and competencies in clinical and occupational medicine, industrial hygiene, toxicology, epidemiology, etc.

(a) Medical and health program

The medical and health plan provides the necessary and important parts of a construction project medical and health program. The objectives of this program are to: Protect employees against occupational health hazards at the construction worksite; Facilitate placement of workers according to their physical, mental and emotional capabilities without endangering their own health and safety or that of others; and Ensure adequate medical care and rehabilitation of the occupationally injured or ill person.

The Contractor will engage the services of a DOHSS approved Designated Health Practitioner (DHP) for undertaking medical examinations in accordance with the Second Schedule of the OSHA and Legal Notice No. 24: Medical Examination Rules, 2005. For those occupations defined in the Second Schedule of the OSHA, the Contractor will avail their employees to a DHP for medical examinations throughout the construction phase of the project during the following occasions:

- Pre-assignment;
- Periodic;

- Post illness or injury; and
- Termination.

An occupational injury or illness will be diagnosed as promptly as practical and treated as appropriate within the capabilities of the workplace medical facility. The contractor's occupational health program should include treatment of emergency conditions at the work site which may occur during the construction phase of the project.

Construction workers and other employees will be inducted to the potential occupational health hazards that they may encounter in their specific roles. The induction will include methods of recognizing and preventing adverse health and safety effects at the work place. The occupational health program will also include training of construction workers on the correct use and maintenance of PPE issued to them. The site HSE Manager will periodically inspect and evaluate the workplace for potential adverse occupational health hazards.

Occupational Health record keeping will be maintained by the site HSE Manager for all employees that are medically examined. The records will contain sufficient data to reproduce a chronology of an employee's medical occurrences, illnesses and injuries. All employee medical records will be maintained confidentially.

If the Contractor engages catering personnel for their staff, it will be mandatory for each food handler to be immunized every six months as required by the Local Government Act.

(b) Record keeping requirements

Medical records will provide data for use in job placement, establishing health standards, health maintenance, treatment and rehabilitation, worker's compensation cases and assisting project management with program evaluation and management. The record keeping requirements will comply with Kenyan laws and regulations as well as the Proponent's insurance requirements.

The Contractor and their appointed DHP will maintain occupational health records of workers as required by Kenyan legislation (OSHA, WIBA (Workers Injury Benefit) and L.N. 24). The DHP will confidentially maintain health examination records of all employees that visit him/her. Examples of records that need to be maintained include:

- ✓ Physical examination reports;
- ✓ Clinical reports;
- ✓ Chest x-rays;
- ✓ Audiograms, etc.

The medical records shall be maintained in locked files and only authorized persons shall have access to them. In certain situations, authorized Government officials may seek requests

for specified medical information. Additionally, an employee or his/her designated representative may seek information about themselves or their environmental exposure. These requests shall be turned over to the project managers for handling.

(c) Inspection program

The site HSE Manager will conduct sanitation and health inspections at the job site to ensure compliance with project medical and health rules and regulations.

The sanitation inspections will cover the following areas:

- ✓ Drinking water;
- ✓ Control of vermin and pests;
- ✓ Toilet facilities;
- ✓ Waste disposal;
- ✓ Dining areas

Written reports will be issued having target dates for corrective actions to be taken by responsible supervisory personnel.

(d) Training

During the construction phase, the Contractor will be required to arrange for training on first aid, health and safety, security and fire safety.

(e) Communications system

The Contractor will be required to develop, rollout and implement a rapid communications system to ensure fast and reliable emergency communications between the project site and crews at the scene of an accident.

(f) Procurement and material control

The Contractor's HSE Manager will develop a master listing of all medical and first aid materials, supplies and equipment that will be needed during the construction phase of the project.

9.3.6. Environment action plan

The purpose of a Construction Environment Management Plan (CEMP) is to specify environmentally sound working methods in order to minimize environmental impact of the construction works associated with the proposed project.

The CEMP identifies key environmental aspects and the related impacts which may occur and specifies methods, measures and controls that the Contractor will comply with during the construction phase of the project.

Key environmental positions

The chapter earlier identified the key HSE positions that will be used to manage health, safety

and environmental aspects during the construction phase of the project. The primary persons from the Contractor's organization responsible for implementing the CEMP include:

- Project Management Engineer;
- Construction Manager;
- Engineering Manager; and
- HSE Manager.

The Project Management Engineer will have overall responsibility for all aspects related to environmental issues and to ensure that the Contractor's environmental policy statement and objectives are complied with. The Construction Manager will be responsible for developing, rolling out and implementing environmental procedures and work instructions in conjunction with the HSE Manager. The Engineering Manager will be responsible for reviewing environmental issues during the design phase of the project.

The HSE Manager will be responsible for several environmental functions including:

- Coordinating environmental inputs to the project and advising the Project Management Engineer and Construction Manager on environmental matters;
- Coordinating the development, rollout and implementation of the Contractor's environment management system (EMS) for the project;
- Routine monitoring of implementation of the contractor's EMS at the project site;
- Authority to halt any works where actions are found to be in contravention of particular environmental procedures, work instructions or legal requirements;
- Authority to amend work instructions and procedures as required by sound environmental management including amendments to the EMS as identified by audits.

Environmental training

The Contractor's management and their sub-contractors will receive environmental induction training prior to commencement of the construction phase of the project. The training will cover the contractor's EMS and environment work instructions relevant to the construction activities.

Environmental objectives

The Contractor will develop an Environment Management System (EMS) in order to comply with basic environmental objectives and targets set for the project. Environmental objectives for the construction phase will be discussed and agreed between the Proponent and the Contractor. The EMS will detail the environmental standards for the project and will include a number of environmental work instructions. The EMS will be implemented in conjunction with the Contractor's health, Safety and Environment Action Plan.

Environmental activities will be audited regularly to ensure continued compliance with predetermined environmental objectives. Environmental work instructions will be developed to comply with all legislative and regulatory requirements as a minimum. The objective is to endeavor to minimize and prevent where possible adverse environmental impacts. The environment work instructions will apply equally to all the contractor's workers, sub-contractors, project consultants and suppliers. The Contractor will provide environmental training for their workers in order to minimize the likelihood of environmentally damaging incidents occurring.

Environmental procedures

The Contractor will develop, rollout and implement environmental procedures for the design and construction phase of the project. The procedures will be organized under two categories namely:

- Management and Organization procedures; and
- Environmental Management Procedures.

The HSE Manager and construction team will develop the above types of environmental procedures jointly. Once drafted, the procedures will be discussed with the Project Management Engineer and Construction Manager to ensure practicability.

Environmental performance meetings

The Contractor will schedule regular meetings to discuss environmental performance of the project during the construction phase. The Project Management Engineer, Construction Manager, HSE Manager and the Proponent will attend the meetings. Minutes of the meetings will be circulated to all employees and posted on construction-site notice boards.

Environmental reviews

Environmental reviews include both inspections and audits to be conducted by the Contractor. Audits will be conducted by the HSE Manager and will include monitoring of construction phase environmental effects against identified performance targets. Findings and recommendations will be shared with the Project Management Engineer, Construction Manager and Proponent.

Inspections of working areas will be performed periodically using appropriate checklists. Construction supervisors will undertake inspections and findings/ corrective actions discussed in daily construction meetings. A tracking system shall be employed for monitoring status of implementation of corrective actions. Records of inspections will be filed on-site and made available to relevant lead agencies and the Proponent.

9.3.7. Soil conservation and erosion mitigation

The Contractor will develop a soil conservation and erosion mitigation plan which will include details on how to perform clearing, grading, excavation, trenching and backfilling work at the project site. During the construction phase, the Contractor will take adequate measures to prevent soil erosion especially during the rainy season and wet the onsite road to reduce soil erosion from dusty surfaces. The integrity of soil erosion mitigation shall be sufficient to provide continued protection against erosion until the site soils have stabilized and added protection is no longer necessary.

Site restoration

Prior to handover of the completed wind power plant to the Proponent, the Contractor will undertake a final cleanup of the entire project site including removal of all non- hazardous and hazardous waste or excess materials. Surface restoration and stabilization will be performed in accordance with environmentally sound practices.

Waste management

Prior to the construction phase but immediately after award of the contract, the Contractor will develop a Waste Management Plan (WMP) for the project. The WMP will be in compliance as a minimum with Legal Notice 121: Waste Management Regulations, 2006 and the Proponent's environmental requirements.

Spill response

During the construction phase, the Contractor will be required to develop, rollout and implement a spill response procedure for any spills that could potentially result from the Contractor's operations.

Work site controls

The Contractor through the HSE Manager and HSE representatives will monitor the project construction-site daily for environmental non-conformities and submit written HSE reports to the Proponent weekly. Remedial action on environmental non- conformities will be implemented as soon as possible when observed. The main contractor on a monthly basis will undertake scheduled environmental inspections and all reports filed on-site for inspection by relevant lead agencies or the Proponent. The Contractor will provide construction workers

with environmental induction training as well as On-The-Job (OTJ) environmental training. On completion of the induction training, each employee will be required to sign a letter stating that non-compliance with the Contractor's environmental policy shall be basis for summary dismissal.

9.3.8. Wastewater management and spill response

During the construction phase there is a potential for effluent generation and fuel spills from a number of sources. To minimize the likelihood of such adverse environmental impacts the Contractor will:

- Bund all on-site fuel storage areas using impermeable materials;
- Establish an early warning system and identification of contingency plans for spill response;
- Monitor the quality of water used before being discharged into the environment.

9.3.9. Noise management procedures

The potential noise generated by construction activities outside normal working hours will be assessed prior to the construction phase of the project and notification sent to the affected persons. The Contractor and appropriate noise control measures implemented will identify noise sensitive receptors.

9.3.10. Traffic management procedures

The proposed construction of the project may have an adverse impact on traffic if not properly managed. Such effects include higher noise levels, generation of dust and additional wear and tear to local roads. The Contractor will develop, rollout and implement a traffic management plan to include careful planning of routes used by construction vehicles, restrictions on vehicle movements and wetting of road surfaces to reduce dust generation.

9.3.11. HIV/AIDS and Covid-19 Virus

HIV/AIDS

The nature of HIV/AIDS pandemic is directly related to the cultural values, tradition and norms embedded in African culture, some being linked to demographic factors, age and gender distribution, morbidity and mortality patterns and increasing urbanization while others are linked to the cultural institutions of marriage and child bearing. Cultural practices in the district as initiation rites, wife sharing, remarriages after divorces and traditional surgery have contributed significantly to HIV/AIDS prevalence. This is further compounded by commercial sex activities in the main urban centres in the district.

HIV/AIDS epidemic is recognized as a National Disaster and as a development problem since its effects and impacts have far reaching social, economic and cultural ramifications within all sectors. The home-based care currently available is not only limited, but also the care providers' concentrate only on women and young girls. This group is already overburdened with heavy domestic workloads. The numerous responsibilities include care for the young in the family, gathering and preparation of food, fetching water, firewood, income generation and general management of the entire household.

Some of the identified obstacles on control and management of HIV/AIDS include inadequate community awareness of the impact of disease due to low levels of accessibility to the communication media such as radios, television, local news-papers and illiteracy. Existing cultural practices do play a major role in control of the HIV/AIDS. Another major constraint relates to the inadequacy of resources to strengthen the coordination, monitoring, testing at the major health institutions in the district.

During the construction and operation of the project there will be an influx of people into the project area. This is likely to increase the incidences of diseases including sexually transmitted diseases (STDs) especially Human Immuno-Deficiency Virus / Acquired Immuno-Deficiency Syndrome (HIV/AIDS) among the project workers. There will be need for people to be educated on HIV/AIDS and sexually transmitted diseases.

The major coping strategies, which will be pursued by the district, will include;

- Increase public awareness/education at all levels,
- Strengthening voluntary counselling services
- Promote use of condoms by improving its supply, and
- Access to the community encouraging voluntary testing and
- Opening HIV/AIDS testing centres in all major health facilities,
- Facilitating/lobbing for improved social, spiritual and economic support for orphans, widow and widowers,
- Establishing HIV/AIDS Resource Centres,
- Availing home based care services for those infected with AIDS,
- Improving prompt treatment opportunistic infections,
- Enhancing multi-sectoral approach to affordable anti-retroviral drugs and
- Strengthening coordination and monitoring of HIV/AIDS activities in the District.

Covid-19 Infection

The Covid-19 pandemic infection and its variant has become a global pandemic and a major

health concern to globally as its devastating effects of health, grave social and economic impacts are being experienced world over. In this regard, it is significant that the project is located off a major Highway to Uganda and thus exposes the area as an easy transmission area for the virus by the many drivers plying the busy route to and from the neighbouring countries. To address this challenge, the Project Proponent will ensure the adherence at all times to the Ministry of Health Protocols issued from time to time including the lock downs and imposed curfews intended to control the spread of the diseases nationally, regionally and globally. Besides, the construction site will maintain the work place the Ministry of Health protocols of social distancing, wearing of masks and hand sanitizing at all times. The Proponent will hold regular site meetings to sensitize the staff on the need to observe the protocols issued by the Ministry of Health.

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

10.1. EMP Objectives and Application

The EMP provides a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition, the EMP identifies those who have the responsibilities assigns responsibilities of actions to various persons and provides a timeframe within which mitigation measures and monitoring can be done. EMP is an important output of an Environmental Impact Assessment as it provides a checklist for project monitoring and evaluation. The EMP covers all aspects of planning, construction, operation and decommissioning of the project, which are relevant to the environment. It is essential to implement the EMP right from the planning stage and then continuing it throughout the construction, operation and decommissioning phases. Therefore, the main objective of the EMP for the Nzoia II Small Hydropower Project is to identify the project's specific activities that would have to be considered for investigation of the significant adverse impacts and the mitigation measures required.

10.2. Role and Responsibilities

The project Proponent, Jiatian (Kenya) Co. Limited, will have overall responsibility for the implementation of the EMP. The Project Proponent will together with the Project Contractor and Project Engineer be involved on day-to-day aspects of decision making in the implementation of the EMP. In addition to the above in-house team, other relevant stakeholders will have an important role to play in the environmental management. They include representatives of the National Environmental Management Authority (NEMA) as represented by the District Environmental Officer (DEO) in Bungoma District, Kenya Wildlife, Water Resources Authority (WRA), Ministry of Health (Local Public Health Officer), Ministry of Labour, the local administration including the District Officer (DO), the Chief and Assistant Chief, relevant Government officers among others.

Tables 10.1, 10.2 and 10.3 contains the details on the EMP implementation plan.

10.3. Mitigation Measures

The EMP has been outlined in Tables 10.1, 10.2 and 10.3 and has addressed the identified potential negative impacts and mitigation measures of the proposed SHP project during its construction, operational and decommissioning phases. These are based on the identified Project Environmental Impacts and Mitigation Measures. Estimates of the costs of suggested mitigation measures have been proposed.

Technical methods will be used to prevent, control and reduce negative impacts and

associated activities in accordance with best available technology and working practices. Efforts will be made to maximize positive benefits and the environmental carrying capacity. Social, economic, cultural and public health approaches will be implemented to minimize negative impacts and enhance positive benefits for the local people in the vicinity of the project area.

To ensure an integrated internal and external management of identified environmental impacts the project proponent plans to use the following institutional approaches:

- Coordination and cooperation with appropriate governmental, local communities, Water Resources Authority, and other agencies and firms to ensure sound environmental management of wind project activities.
- Regularly updating information to improve the intention and understanding of regulations and laws at the national and local levels so that project Proponent activities conform to existing laws and regulations.
- Regular reporting on environmental performance.

10.3.1. During construction

Table 10.1-Environmental Management Plan during Construction

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
Extraction-site impacts to ensure efficient use of raw materials in construction	• Source building materials from local suppliers who use environmentally friendly processes in their operations. • Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered. • Ensure that damage or loss of materials at the construction-site is kept minimal through proper storage.	• Project Proponent - Jiatian /Contractor • Project Engineer	Routine	Periodic and surprise checks	20,000 per month
Loss of vegetation cover and habitat	• Ensure proper demarcation and delineation of the project area to be affected by construction works. • Adequate compensatory afforestation though introduction of vegetation (trees, shrubs and grass) on open spaces and around the project site and their maintenance. • Avoid destruction of natural habitat -- flora and fauna. Preservation of individual trees within the site. • Design and implement an appropriate landscaping programme to help rejuvenate vegetation in the project area following construction.	• Project Proponent - Jiatian /Contractor • Project Engineer	Routine	Periodic and surprise checks during construction	200,000 per month over the construction period

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
Soil erosion due to excavated soils	• Roadways and footpaths will be paved with impervious material. • Drainage will be constructed to control storm rain water. • Design of a storm, water management plan. • Excavation will be restricted to onsite access road surface and camp site, turbine foundations, diversion tunnels, etc. • Excavated earth will be kept away from trenches and locations of sites that are not susceptible to surface water run-off. • The exposed areas will be planted with grass and trees to mitigate soil erosion from surface water run-off. • A retaining wall will be setup around selected spoil disposal area.	• Project Proponent - Jiatian /Contractor • Project Engineer	Routine	Periodic and surprise checks during construction	Included in construction costs
• Air pollution by dust and VOCs generated during constructio	• All personnel working on the project will be trained prior to starting construction on methods for minimizing air quality impacts during construction. • Heavy earth moving vehicle drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon and minimize idling of engines during construction. • Careful screening of the construction-site to contain and arrest	• Project Proponent - Jiatian /Contractor • Project Engineer	Periodic Activities	Periodic and surprise checks	200 000 per month over The construction Period)

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
n process.	construction-related dust that is generated. • Exposed stockpiles of e.g. dust and sand, will be enclosed, covered, and watered daily, or treated with non-toxic soil binders. • All workers will be required to wear PPE. • Construction machinery and equipment will be well maintained to reduce exhaust gas emissions				
• Fish and wildlife passage	• Overflow weir will be provided at the left bank of the weir. • Construction of fish-ways of fish ladders for fish migration and movement • Construction of overpass, culvert or bridge for other wildlife will be considered • Appropriate filters systems "fish friendly" turbines and other water organisms will be considered	Project proponent- Prunus /Contractor. • NEMA inspectors	Periodic inspection	Periodic and surprise checks	Will be considered during construction of the project

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
Dust, Noise, and vibration by construction activities.	• Use of equipment designed with noise control elements will be adopted where necessary. • Trucks used at construction-site shall be routed away from noise sensitive areas where feasible and limited to off-peak hours of operation. • Idling time for pick-up trucks and other equipment will be minimized. • All workers operating in noisy areas or operating noisy equipment will be provided with ear protection to protect against extreme noise. • Compliance with Noise and Vibration Regulations, 2009. • Compliance with L.N. 25: Noise prevention and control rules, 2005 • All construction work will be done during the day-time. • Automatic cement injection pump can be used to reduce air pollution and cement waste • Any stockpiles of earth or opened areas will be covered/watered during dry or windy conditions to reduce emissions • Trucks carrying excavated materials and delivering sand and cement will be covered • Dust masks shall be provided to all personnel working in areas prone to	Project Proponent- Jiatian/contractor Divisional Public Health Officer Ministry of Labour Workers NEMA inspectors	Routine Activities	Periodic and surprise checks	100 000 per month over the construction period

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
	dust emissions, particularly those working in concrete mixing areas, and onsite access road areas. • Working machinery and equipment will be kept in good working conditions to minimize emissions of CO, NOx, Sox, and suspended particulate matter.				
Traffic and Transport	• Adequate maintenance carried out to reduce emissions. • Vehicles will comply with axle load limits as set out by National Transport and Safety Authority (NTSA). • Well trained and experienced drivers will be used. • All special transport will be done in accordance with Kenya Police and Road Regulations, Rules and guidelines • Heavy commercial vehicles will comply with regulations by the Ministry of Transport and NTSA traffic vehicles	Contractor NTSA Ministry of Transport	Routine Activities	Periodic and surprise checks	150,000 per month
Aquatic ecosystem and ecological	• Compliance with WRA regulations to ensure environmental flow maintained in the river at all times. • Provision of measuring Gauge to at least ensure release of Q95 (10.03 m3/s) will be allowed past the weir in the river at all	• Contractor • WRA • NEMA	Routine Activities	Periodic and surprise checks	100,000 per month

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
sustainability	times. • Provision of facilities for periodical release/flushing of the sediments held back by the raised canal and weir structure				
Workers accidents and hazards	• Compliance with occupational Health & Safety Standards. • Training in Health and Safety procedures • Adequate collection and storage of waste will be provided on-site, and safe transportation to, and display methods at designated areas. • All receptacles for storing hazardous wastes shall be adequately covered. • All employees will be required to wear PPE when handling hazardous wastes. • All workers will be adequately insured against unforeseen accidents. • Exposure to dust from cements and sands will be minimized. • Adequate lighting provision inside and outside workers camp living areas. • Security personnel employed to guard project, and site well fenced.	• Project proponent- Prunus /contractor • Provincial Public Health Officer • Ministry of Labour • Workers • NEMA inspectors	Routine Activities	Periodic and surprise checks	200 000 per month
Generation of solid waste	• Wastes to be collected regularly to control air pollution and vermin/insects etc.	• Project Proponent	Routine Activities	Periodic and surprise checks	100 000 per month

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
And possible oil spills	• Receptacles will be provided for waste segregation and storage prior to collection. • Resource recovery will be encouraged once the project takes off including waste construction materials recovered for refurbishing and used in other projects. • Sale or donation of recyclable/reusable materials to construction companies, local community groups, institutions and individual residents and home-owners. • Refuse collection vehicles will be covered to prevent scatter of wastes by wind. • The Proponent/Contractor will ensure that there are sanitary facilities to cater for workers and visitors to the project site. Waste from these facilities will be managed appropriately through provision of onsite sanitation facilities. It will also be important to ensure that toilets are kept clean and properly maintained. The waste discharge will conform to NEMA discharge guidelines. • The Proponent/Contractor will control oil spills by maintaining the machinery in specific areas designated for this purpose.	• Hired private contractor • Provincial Public Health Officer • NEMA inspectors			

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
	• All persons involved in refuse collection shall be in full protective attire				
Water Quality Degradation	• The reservoir site below the normal water level will be cleaned before the reservoir is filled and remove the floating debris. • Strengthening of monitoring of water quality and removing the floating garbage from the reservoir in a timely manner. • The Project Proponent will partner with the Bungoma and Kakamega County Governments in strengthening forest protection in the upstream area. • Physical methods commonly used in hydropower engineering will be adopted to treat the production wastewater. Simple dry toilets and septic tanks should be set up in the construction and living areas to collect domestic wastewater. After regular disinfection and treatment, the waste will be transported to the designated domestic disposal site for centralized treatment. • Water storage tanks will be installed to store water for use on site so as not to strain local sources.	• Project Proponent-Jiatian • Contractor • County Director of Public Health	Routine Activities	Constructed once and maintained periodically	@ 20 million

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
High Voltage Power lines	• The proposed high voltage power line will pass along the river riparian way-leave. • The power line will pass at least 300 m away from the residential areas	• Project Proponent • Contractor	Routine Activities	Constructed once and maintained periodically	Will be part of Construction budget.

10.3.2. Social -Economic During Construction

Table 10.2-Socio-Economic Management Plan during Construction

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
Increased Population Around the Project Area; increased water demand; increased pressure on infrastructure; increased insecurity	• During construction, construction water will be drawn from River Nzoia and the Project Proponent/Contractor will ensure water is used efficiently by sensitizing the site staff to avoid waster wastage; • Water storage tanks will be constructed to store water from the Webuye Water Supply for consumptive use by the site staff; the project area community will be sensitized by the local administration the increased population in the project area and the appropriate cautions; • The project Proponent will provide adequate lighting inside and outside the living area; • the project site will be secured though	Project Proponent/Contractor Webuye water Supply Local administration	Site meetings	Monthly	Part of Project budget and additional 150,000 monthly

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
	erecting a fence around the land boundary; • security personnel will be deployed at the project site 24/7. • The two access roads leading to the project area site will be upgraded to be motorable at all weather.				
Cultural Heritage --more diverse cultures attracted And public health	• Creation and raising awareness along the local community on diverse cultures attracted by the project to provide labour and services • Sensitization of local community on likely health challenges that may arise from HIV AIDs/COVID-19 Infections • Promotion of Ministry of Health Protocols on Covid-19 prevention	Project Proponent County Director of Public Health Local administration Local Health Centres	Routine	Periodic	20,000
Land Acquisation for SHP plant	• The land for the construction of the SHP has been purchased form individual land				

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
	owners and were in addition compensated for buildings, crops and other developments on the land • The individual who have sold the land have more land within the area and others purchased better agricultural lands within the area • The individual land owners and the Project Proponent developed land sale agreements and compensations and these were executed as per the sale agreements				
Mining of construction sand at project site	• The mining of construction sand is a practiced along the Nzoia River and thus the people mining the sand at the site where the SHP plant is located can relocate downstream of the present mining location which is only about 200m downstream of the current site	Project Proponent/Contractor Community elders Local leaders County Administration	Implementation of proposed measures	Review during site meetings	Budgeted at project implementation and monthly 20,000

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)
	• The project Proponent shall ensure periodical flushing of the trapped upstream of weir structure. This will make mining of the sand in the river more efficient and predictable • The project Proponent with assist in selecting an alternative sand mining site. • The Project Proponent will consider designing and constructing a footbridge on top of the weir structure to facilitate safe crossing of the river. The community expressed concern that many people drown in the river while crossing the river and thus a footbridge will be quite appropriate at that location.				

10.3.3. During operation

Table 10.3-Environmental Management Plan during Operation

Possible Impact	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Ksh)
Generation of solid waste and possible oil spills	• The solid waste generated will stored in sanitary solid waste cisterns and a Solid Waste Contractor contracted to collect and dispose the waste. • The Proponent/Contractor will ensure that there are sanitary facilities to cater for workers and visitors to the project site. Waste from these facilities will be managed appropriately through provision of onsite sanitation facilities. It will also be important to ensure that toilets are kept clean and properly maintained. The waste discharge will conform to NEMA discharge guidelines. • The pressure oil system for the SHP is in a fully sealed state, with small capacity and limited oil consumption. The pressure oil	Project Proponent/Contractor County Public Health Officer	Routine Activity	Periodic and surprise	500,000 per month

Possible Impact	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Ksh)
	will be drained and discharged into the oil storage barrel, then processed, so that oil will not leak and affect the environment.				
Water Quality Degradation	• Strengthening of monitoring of water quality and removing the floating garbage from the reservoir in a timely manner. • The Project Proponent will partner with the Bungoma and Kakamega County Governments in strengthening forest protection in the upstream area. • Physical methods commonly used in hydropower engineering will be adopted to treat the production wastewater. Simple dry toilets and septic tanks should be set up in the construction and living areas to collect domestic wastewater. After regular disinfection and treatment, the waste will be transported to the designated domestic	Project Proponent – Jiatian, County Director of public heath NEMA			

Possible Impact	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Ksh)
	disposal site for centralized treatment. • Water storage tanks will be used to store water for use on site so as not to strain local sources. • Proper management of the drainage system and run-off management on the steep slope to avoid soil erosion.				
Fish and Wildlife Passage	• Proper maintenance of the overflow weir at the left bank of the weir. • Proper maintenance of fish-ways of fish ladders for fish migration and movement • Proper maintenance of overpass, culvert or bridge for other wildlife • Proper maintenance of filters systems "fish friendly" turbines and other water organisms will be considered	Project Proponent-Jiatian /contractor. WRA regional office NEMA inspectors	Periodic inspection	Periodic and surprise Checks	50,000 per month

Possible Impact	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Ksh)
Aquatic ecosystem and ecological sustainability	• Ensure compliance with WRA regulations to ensure environmental flow maintained in the river at all times. • Maintenance of the river measuring gauge to ensure release of at least Q95 (10.03 m3/s) will be allowed past the weir in the river at all times. • Maintenance of facilities for periodical release/flushing of the sediments held back by the raised canal and weir structure	• Contractor • WRA • NEMA	Routine Activities	Periodic and surprise checks	500,000 per month

10.3.4. Social Economic During Operation

Table 10.4-Socio-Economic Management Plan during Operation

Possible Impacts	Proposed Mitigation Measures	Responsibility for Mitigation	Means for Monitoring	Frequency for Monitoring	Estimated Cost (Kshs)

Mining of construction sand at project site	• The mining of construction sand is a practiced along the Nzoia River and thus the people mining the sand at the site where the SHP plant is located can relocate downstream of the present mining location which is only about 200m downstream of the current site • The project Proponent shall ensure periodical flushing of the trapped upstream of weir structure. This will make mining of the sand in the river more efficient and predictable • The project Proponent with assist in selecting an alternative sand mining site. • The Project Proponent will consider designing and constructing a footbridge on top of the weir structure to facilitate safe crossing of the river. The community expressed concern that many people drown in the river while crossing the river and thus a footbridge will be quite appropriate at that location.	Project Proponent/Contractor Community elders Local leaders County Administration	Implementation of proposed measures	Review during site meetings and surprise reviews	Budgeted at project implementation and monthly 20,000

10.3.5. During Plant Decommissioning

Table 10.5- Anticipated Environmental Impacts and Mitigation Measures at Decommissioning of Project

Impacts	Mitigation Measures	Responsibility	Estimated Budget
Air Pollution	• The demolition exercise will be limited to day time only • All personnel working on the project will be trained on methods for minimizing negative impacts on air quality prior to commencing the demolition. • Construction vehicle drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon and minimize idling of engines. • All active demolition areas will be watered at least twice a day to reduce dust. • All trucks hauling demolition debris/wastes shall be covered. • Careful screening to contain and arrest demolition related dust will be adopted • Exposed demolition debris of e.g. dust and sand, will be enclosed, covered, and watered daily before being transported to disposal site • .All workers on the site will be required to wear protective gear while on duty**.**	• Project proponent /Contractor • NEMA inspectors	Main budget included in de-commissioning and demolition Budget Additional Ksh 50,000 per month

Impacts	Mitigation Measures	Responsibility	Estimated Budget
Noise pollution from decommissioning activities	• Portable barriers will be installed to shield compressors. • Use of equipment designed with noise control elements will be adopted where necessary. • Trucks used during demolition exercise on-site shall be routed away from noise sensitive areas in the neighbourhood, where feasible. • Idling time for trucks and other small equipment will be minimized to limited time. • Use of very noisy equipment will be limited to daytime only. • All workers operating in noisy areas or operating noisy equipment will be provided with ear protection to protect against extreme noise. • The demolition exercise will be limited to day time only.	• Project Proponent • Contractor • NEMA inspector	Monthly budget estimate Ksh 200,000
Traffic and Transport	• Carry out fuel deliveries and demolition activities during the day to avoid noise and disruption of sleep to the residents of the neighbouring centre. • The demolition materials which can be used locally will be donated to the community	• Project proponent /Contractor • NEMA inspectors	Ksh 20,000 monthly
Demolition debris and	• Private contractor will be engaged to collect demolition	Project Proponent	1.5m

Impacts	Mitigation Measures	Responsibility	Estimated Budget
related wastes	debris/wastes. • All debris/wastes to be collected regularly to control air pollution and injury etc. • A licensed contractor will be engaged to avoid illegal final dumping at unauthorized sites will collect demolition debris. • All persons involved in refuse collection shall be in full protective attire.	NEMA inspectors Contractor	
Workers accidents during demolition process.	• All workers will be sensitized before the exercise begins, on how to control accidents related to the demolition exercise. • A comprehensive contingency plan will be prepared before demolition begins, on accident response. • Adherence to safety procedures will be enforced at all stages of the exercise. • All workers, pursuant to labour laws, shall be accordingly insured against accidents. • All workers will be provided and instructed to wear protective attire during demolition, including helmets. • Demolition work will be limited to daytime only avoid	• Project Proponent /Contractor • County Director Public Health Officer • Ministry of Labour • NEMA inspectors	Ksh 200,000 per month

Impacts	Mitigation Measures	Responsibility	Estimated Budget
	workers' accidents due to poor visibility. • Provision of mobile clinics.		

10.4. Contribution to socio-economic development

The implementation of the Small Hydropower (SHP) Plant will have socio-economic impact at the local, regional and national context. The project no doubt will have positive impacts which will contribute to socio economic development to the people living in the neighbourhood of the project, within the Bungoma/Kakamega Counties in Kenya as a whole.

10.4.1. Increase in electricity supply

The SHP project will provide an additional of 20 MW of the green energy renewable energy to the national grid. It is noteworthy that western Kenya has the lowest electrical grid connectivity in Kenya and the 20 MW hydropower will have a direct impact of the electrical power in the region. The additional hydropower into the grid will not only boost the western region investment in industries and commercial investors but also connectivity to the local energy consumers such as educational establishments, health facilities, social establishments within the project areas and its environs. Due to improved reliable energy supply, more investors will be expected to be attracted into the area. In the overall the increased power supply will socially and economically impact positively locally and nationally.

10.4.2. Employment Opportunities

The implementation of the SHP plant will impact on employment opportunities during the construction, operation and maintenance of the project. The employment opportunities skills required include: engineers, project managers, environmentalists, drivers, technicians, health personnel, security personnel, manual workers, among others. There could be other indirect sources of employment e.g., informal businesses at the worker's camp including food supplies to the project worker's camp.

10.4.3. Increase in Revenue

The sale of power will lead to increased revenue to the government and the Kenya Power. In addition, the project will in the overall realize increased revenue in the local area arising from various project activities.

10.4.4. Improved Security

The project area community decried the level of the insecurity in the project area during the project area stakeholders' workshop. With the implementation of the SHP project, the security will be improved around the project area. This is as a result security lights and security personnel employed to guard the SHP plant and the project area in general. The project site will also be fenced off.

10.4.5. Attractive Scenery

The implementation of the SHP Plant, the weir, the generator and the turbines, the diversion

channels and the transformer will offer attractive scenery in contrast to the present rock-bare exposed site arising from cutting of trees for the rampant charcoal burning activity. This will attract tourist wishing to visit the area to see the project and view the scenery.

10.4.6. Reduced Degradation

The Project Proponent proposes to develop environmentally appropriate plans with the County and other stakeholders to reduce the degradation and maintain healthy ecosystem in the Nzoia river catchment. In addition, the Project Proponent will rejuvenate habitat in the project site by planting additional trees and preserving the existing ones during the implementation of the SHP and the operation phase as well.

10.5. Reporting

All HSE actions will be monitored and reported periodically as required by NEMA and, where appropriate, project financiers. Reports will be provided to all relevant parties on project performance, together with clearly defined corrective action where this is seen to be required. Reporting systems and structures will be reviewed regularly as to their effectiveness and corrected where necessary. Reporting will include the provision of information on the project performance to external stakeholders and surrounding communities and its environs.

ENVIRONMENTAL AND SOCIAL ACTION PLAN (ESAP)

11.1. Introduction

As part of corporate commitment to managing project in a responsible, safe and sustainable manner such that protection of the environment and safety of people take priority, an Environmental and Social Action Plan (ESAP) that describes the environmental and social management measures that will guide the project implementation has been prepared. The EMP presented in Chapter 10 includes mitigation activities and broad management responsibilities. The ESAP presented here expands on the EMP to identify compliance with the relevant Kenyan and international standards.

The ESAP has been prepared in accordance with the environmental and social review procedure set out in the EMCA (1999) and International Finance Corporation (IFC) standards. It incorporates all mitigation measures required and that have been agreed following extensive consultations with a wide range of interested parties, to ensure that all environmental regulations are met. It includes the specific mitigation measures identified in the ESIA and details the organization/body responsible for the action, the period for which the action should be taken, and the need for short, medium or long-term monitoring.

11.2. Necessary Principles for the ESAP

The following principles were adopted in preparation of the ESAP:

- Compliance with relevant legislation, standards, codes and practices in the application of safe technologies;
- Minimization of impacts on the environment and human beings;
- Performance of all activities in a safe and effective manner;
- Maintenance of all equipment in good operating condition for the protection of the health and safety of all persons; and
- Conserve the environment and property.

The Environmental and Social Action Plan (ESAP) has been designed to address the key problem areas identified for the SHP project and substantially decrease the environmental and social negative impacts as well as improve the quality of output.

Table 11.1- Description of the Environmental and Social Action Plan and Management

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
11.3. Environmental Management							
1	Promote and enhance integrated quality environment, health and safety management	Integrated control over quality environment and health and safety issues. Continuous improvement	IFC standards and exhibit III; ISO 9001, ISO 14001 and OHSAS 14001 standards National regulation: LN: 101	Internal resources	2024 Small Hydro power Plant Commissio n (SHPC)	ISO 9001, ISO 14001, OHSAS 18001 compliance and Certification	Comments
2	Definition of new	Effective	ISO 14001;	Internal	2024	Updated environmental	-

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
	environmental aspects/impacts to be monitored during construction	monitoring of potential environmental aspects associated to the construction	National regulation: LN: 101 l	resources	(SHPC)	aspects identification	
11.4. Environment							
1	Enforce noise mitigation measures (noise mufflers, traffic and protective housing for generators, installation of equipment inside closed structures, sound insulation)	Reduction of noise impacts on the surrounding properties, to comply with regulations and minimize the risk of claims	World Bank guidelines and IFC PS 3 ISO 19011 National Regulations: LN 25; LN 61	The investment need is already included in the Investment Programme	2024 (SHPC); Maintain throughout the project cycle	Noise levels below regulatory limits and permissible levels	Noise mitigation measures already defined in the ESIA study

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
		from neighbours					
2	Ongoing monitoring of the content of solid particles in the atmosphere, VOCs and meteorological conditions of the subsidence construction Area	Monitoring to exercise control and prevent impact on the environment	WHO air quality guidelines; National Regulations: LN 24; LN 60; Best practices	The investment need is already included in the Investment Programme	2024 (SHPC); Maintain	Register with updated data about solid particles in the atmosphere, radioactivity and meteorological conditions regarding subsidence construction area	Provide update in each annual report
3	Geodetic survey including; excavated grounds,	Monitoring to exercise control and prevent	IFC standards; National Regulation:	The investment need is already included in the	2024 (SHPC); Maintain	Geodetic data, soil and vegetative parameters regarding subsidence	Provide update in each

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
	vegetation disturbance and oil spills of the subsidence construction area	impact on the environment	LN 121 Best practices	Investment Programme		construction area	annual report
4	Monitoring of water quality in the subsidence construction area	Monitoring of water quality to exercise control and prevent impact on the environment	National Regulations: LN 120 Best practices	The investment need is already included in the Investment	2024 (SHPC); Maintain	Water quality data regarding subsidence construction area	Provide update in each annual report
5	Separate system for leachate collection and for the drainage of water	Protection of surface water and groundwater	National Regulations: LN 120; LN 121 Best	The investment need is already included in the Investment	2024 (SHPC); Maintain	Separate collection of leaches ate and superficial water in the subsidence	-

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
	accumulating on the surface in the subsidence construction area		practices	Programme		construction area	
11.5. Health and Safety							
1	Monitoring of subcontractors' compliance with health & safety requirements	Periodic surveys to verify subcontractors' compliance with H&S policy/procedures and contract requirement	OHSAS 18001 WHO air quality guideline; IFC standards 3 and 4: National Regulations: LN 24; LN 3;	Internal resources	2024 (SHPC); Maintain throughout the project cycle	Number of inspections performed. Number of non-compliances detected (e.g. subcontractors not wearing required PPEs or not using required	Provide update in each annual report

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
			LN 56 and LN 60 Best practices			protective equipment	
2	Qualified subcontractors – insert in the register of qualified subcontractors a penalizing system for those found not to be compliant with H&S	Control and improvement of H&S operations executed in the Plant	ISO 10012; Best practices	Internal resources	2024 (SHPC); Maintain	Updated register of qualified subcontractors	-

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
	requirements						
3	Health &Safety monitoring - creation of a register including also near-misses' events, STIs and subcontractors' accidents from equipment, machinery and vehicles/trucks.	Monitoring of happened accidents and of critical situations/events that could lead to accidents.	National Regulations: LN 31; Public health Act (chap 242); Best practices	Internal resources	2024 (SHPC); Maintain throughout the project cycle	Number of accidents and STIs cases per typology of gravity and place of occurrence (both for power plant employees and subcontractors) Number of near-misses' events per typology of gravity	Provide H&S statistics in each annual report

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
						and place of occurrence (both for power plant employees and subcontractors)	
11.6. Social							
1	Definition of a formal procurement policy	Even if anti-bribery Recommendations are present in contracts, definition of a clear and shared	ISO 10014; Best practices	Internal resources	2024 (SHPC) ; Update continuously	Procurement policy accessible to employees, project proponents and contractors	-

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
		procurement company policy					
2	Development of a Stakeholder Engagement Plan	Definition of a clear framework for Stakeholder engagement and consultation	IFC PS5	Internal resources/External consultants	2024 (SHPC)	Stakeholder Engagement	-
3	Creation of a Stakeholder register	Systematic identification of all stakeholders involved, to be used for defining communication strategies	IFC PS 5; ISO 10013 Best practice	Internal resources (PR department	2024 (SHPC) ;Maintain	Updated stakeholders register available	-

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
4	Creation of a register of external communications, including the minutes of the meetings held with the public	Systematic collection and analysis of communications with external stakeholders, in order to provide more effective response to all	IFC PS 5 Best practices	Internal resources	2024 (SHPC); Maintain	Updated external communication register available	-

Item #	Description of Environmental/Social Action	Environmental and Social Risks/Befits	Reference Standards (i.e. Legislative, Best Practices)	Investments Needs/Resources	Targeted Completion Date/Time Frame	Indicators/Status	Comments
		enquiries					
5	Creation of grievance management system	Grievance system accessible and monitored, in order to prevent possible problems with internal and external stakeholders	IFC PS5	Internal resources (allocate HR and PR staff to grievance management)	2024 (SHPC); Maintain throughout the project cycle	Grievance system regarding both community and workers Total number of community grievances, and number of unresolved grievances Total number of labour grievances, and number of unresolved grievances	Provide update in each annual report

Key:

PR – Public Relation HR – Human Resource

ISO 9001: Quality Management Systems

ISO 14001: Environmental Management System

OHSAS 18001: Occupational Health and Safety Management System

ISO 19011: Quality and Environmental Management Systems Auditing

ISO 10013: Quality Management System Documentation

ISO 10014: Financial and Economic Benefits

ENVIRONMENTAL MONITORING PLAN

12.1. Introduction

An Environmental Monitoring Plan (EMP) is vital for any Environmental and Social Management Plan of a development project. The monitoring plan helps in assessing the effectiveness of proposed mitigation measures, in assessing changes in environmental conditions and to provide warning of significant deterioration in environmental quality for further preventive action. The principal elements of a monitoring plan are:

- A clear statement of aims and objectives
- A description of sampling sites
- A description of variables that will be measured
- Proposed frequency and timing of sampling
- An estimate of the resources required to implement the design
- Delineation of responsibility to implement the monitoring plan
- A plan for quality control and quality assurance

Environmental monitoring will be required both during the construction and operation phases of the project. Timing and responsibility for the implementation of the proposed mitigation measures are given in the Environmental and Social Management Plan (ESMP) in Chapter 9. Key measurements and indicators used in the baseline studies should be continued in the monitoring phase.

12.2. Summary of Environmental Monitoring Programme

The environmental monitoring programs are presented in Table 12.1 and Table 12.2

Table 12.1- Environmental Monitoring Programme during Project Construction Phase

S.No.	Item	Parameters	Frequency	Location
1.	Erosion and siltation	• Soil erosion rates, and water run-off areas.	Quarterly	Project site
2.	Noise	• Noise limits.	Monthly	At major construction-sites
3.	Accidents & Diseases	• HIV/AIDs, STDs and other diseases • Accidents; hazardous materials	Quarterly	Project area and environs
4.	Vegetation and habitats	• Vegetation structure, biodiversity, fuel wood,	Twice a year	Project area and environs
5.	Water quantity	• Nzoia River Downstream of SHP Plant site • As per the National Regulations: LN 120	Monthly	Downstream the scheme.
6.	Air pollution	• Particulates, especially dust as a result of earthworks and construction machinery	Monthly	In the project area and environs where major works will take place
7.	Crime	• Registered crimes/disputes; • crimes/disputes involving • women; crimes/disputes involving vulnerable groups	Monthly	In the project area and environs
8	Demographic	• Total population, in- and out-migration, structure	Annual	In the project area and environs

S.No.	Item	Parameters	Frequency	Location
	and population changes	of the population & vital statistics; informal settlements		
9.	Infrastructure	• Housing, health facilities, water, transport & communications	Annual	Urban centres in the project area
10.	Surface and ground water quality	• As per the Second Schedule of Legal Notice # 120 2006	monthly	River :same locations that were sampled during baseline studies
11.	Solid waste generation	• Types and sources of solid wastes	monthly	Project area
12.	Soil and water Pollution	• Oils and greases	quarterly	Project area
13.	Water	• Rain water run-off in different areas of the project	monthly	Project area
14.	Accidents and hazards	• Number, causes and actions taken	quarterly	Project area

Table 12.2-Environmental Monitoring Programme during Project Operation Phase

S. No.	Item	Parameters	Frequency	Location
1.	Water quality (sources of domestic water)	• As per the Second Schedule of Legal Notice # 120 2006	Monthly	Water source: same locations that were sampled during baseline studies
2.	Effluent discharge Into the environment	• As per the Fourth Schedule of Legal Notice # 120 2006	Monthly	River: locations that were sampled during baseline studies
3.	Water related diseases	• Identification of water related diseases, adequacy of local vector control and curative measure etc.	Three times a year	Labour camps and farmers homes.
4.	Ecology	• Status of Afforestation programmes	Annual	Project area
5.	Soil siltation erosion and	• Types and rate of erosion on pastureland and rain water catchment.	seasonally	Project area
6.	Noise	• Noise limits for different working environments	Monthly	Wind power
7.	Accidents & Diseases	• HIV/AIDs, STDs and other diseases Accidents; hazardous materials	Quarterly	Project area and environs
8.	Vegetation and habitats	• Vegetation structure, biodiversity, fuel wood,	Twice a year	Project area and environs
9.	Demographic and population changes	• Total population, in- and out-migration, structure of the population & vital statistics;	Annual	In the project area and environs

S. No.	Item	Parameters	Frequency	Location
		informal settlements		
10.	Wildlife	• Types and condition of habitats (nesting places, breeding grounds, feeding places etc); endemic biota	Annual	Project area and environs
11.	Infrastructure	• Housing, health facilities, water, transport & communications	Annual	Urban centres in the project area
12.	Surface and ground water quality	• As per the Second Schedule of Legal Notice # 120 2006	monthly	River: same locations that were sampled during baseline studies
13.	Solid waste generation	• Types and Sources of solid wastes	monthly	Project area
14.	Soil and water pollution	• Oils and greases	quarterly	Project area
15.	Accidents and hazards	• Number, causes and actions taken	quarterly	Project area

CONCLUSION AND RECOMMENDATIONS

The findings conclude that:

(i) The Community, their local leader, county and national government support the construction of the Small Hydropower Plant power since it is envisaged that, the project will bring numerous social economic benefits.

(ii) Local leaders are an entry point into the Community hence the Project Proponent should ensure that they are involved at all stages of the project cycle to ensure smooth implementation of the project.

(iii) The proposed project does not pose adverse socio-economic impacts and is an initiative towards improving accessibility in the area. Therefore, it is a project worth implementing.

(iv) The project will not cause any significant negative impacts on the environment but to the contrary it will be instrumental in reducing and reversing certain negative environmental processes that are already noticeable such as the degradation of vegetation and trees cutting for charcoal burning, erosion and impoverishment of the water catchment area.

(v) Thus, the Study recommends timely implementation of the project with strict adherence to the proposed Environmental, Management, Social and Monitoring Plans. The project benefits have been identified to far outweigh the negative impacts for which mitigation and action plans have been prepared. The SHP Plant as has been proposed in many past studies pose low Environmental and Social Impact in comparison to huge hydropower plants and other similar energy projects such as coal, thermal power energy generation plants, etc.

(vi) Further, the proponent has carefully considered and applied acceptable local and International Standard/Regulations at all stage of project planning.

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- The Public Health Act (Cap. 242)
- The Local Government Act (Cap. 265)
- Occupational Health and Safety Act (2007)
- Sessional Paper No. 6 of 1999 on Environment and Development
- The Penal Code (Cap. 63)
- The National Environmental Action Plan (NEAP)
- The National Poverty Eradication Plan (NPEP)
- The National population census statistics, 2009
- Land Adjudication Act cap 95

- The Antiquities and Monuments Act 1983 cap 215
- The Lake and Rivers Act Cap 409
- The Employment Act, 2007 [Amendment Act, 2019]
- The Limitation of Actions Act Cap 22
- The Environmental Management and Co-Ordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006.
- The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009, [Amendment Act 2021\
- The Environmental Management and Co-Ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009
- National Biodiversity Strategy Action Plan
- Controlled Substances Regulations, 2007 (Legal Notice No.73 of 2007)
- Waste Management Regulations, 2006 (Legal Notice No.121)
- EnvironmentalManagement and Co-ordination (Waste Management) Regulations, 200
- The Valuers Act Chapter 532
- The Environment (Impact Assessment and Audit) Regulations 2003
- The Poverty Reduction Strategy Paper (PRSP)
- The Rio Declaration on Environment and Development
- The World Commission on Environment and Development
- Wildlife (Conservation and Management) Act Chapter 376 of the Laws
- www.ifc.org/ifcrt/content/environmentalguidelines
- Updated SREP Draft Investment Plan-May 2011.

LIST OF APPENDICES

15.1. `Appendix 1 Public Consultation and Attendance

15.1.1. Appendix 1.1 REPORT ON MOBILIZATIN AND SENSITIZATION REPORT FOR THE NZOIA II 20 MW SMALL HYDROPOWER PLANT

Introduction

The field exercise took 5 days from Saturday 20th February 2021 to Wednesday 24th February 2021. The exercise covered two locations namely; Maraka and Mihuu locations both in Bugoma County that nears the proposed project area. Some of the areas visited during the exercise include; DCC office, Lukhoba Dispensary, Rai Paper, May's Place and the Proposed Project Area. There were two short meeting held at Nabyole hall and Mwalimu Darajas. These meetings were meant to explain the nature of the proposed project.

Mr. Francis Mburu Muturi conducted the activity and Edwin Shivachi assisted Janet Muyekho elder in Mihuu Location and Truphosa Taracha as coordinator Maraka location. The exercise was done with an aim of preparing public participation meeting planned to take place on **Tuesday 9th March 2021**.

PUBLIC PARTICIPATION PLAN

The following category of people were identified as those who would be invited for the public participation. The people identified were classified as follows;

a. Leadership for example the MCAs
b. Administration for instance chief and assistant chief
c. Community elders (Nyumba kumi)
d. Heath centre representatives
e. Market representatives
f. Church representatives
g. Project area community
h. project area immediate neighbours

Public Participation Invitation

Invitation will be done through the contact persons identified (**Janet Muyekho** and **Truphosa Taracha**) and also using contacts given by the people to be invited. The following are the names of those who will be invited to attend the public participation.

S/NO	NAME	PHONE	COMMENT
1	Joseph Chimakile	0712080398	

2	Jessey Matanda		
3	Gilbert Situma	0715896126	
4	Mary Nyamiti		Elder
5	Gladyce Sikanga	0748939828	
6	Geofrey Shiundu		
7	Moses Barasa	0728955086	
8	Jacob Kakai		
9	Beatrice Chilande	0710330086	
10	Andew Sikanga	0729212282	
11	Kinsly Mutali	0722733113	
12	Melvis Wekesa	0743761437	Facilitator
13	Jane Akinyi		Facilitator
14	Paul/ Ben		
15	Amos Biketi	0719413070	
16	Emanuel Situma	0724758144	
17	Elizabeth Wanyonyi	0717094653	
18	Margret Wayeko	0729212282	
19	Jacob Werunga	0710337245	
20	Janet Muyekho	0724840120	Contact Person
21	Samuel Kisuya	0723062469	Chief Muhuu Location
22	Mukwei	0724310127	Chief Maraka Location
23	Josphine Mukhwana	0712148338	Ass. Chief Muchi sublocatio
24	Joseph	07104440244	Asst. chief
25	Nyamawi Chaka	0713816049	DCC Webuye
26	Leah Mutali	0725793836	In charge Maraka Dispensary
27	Isaac Karum	0707550495	Chairman Maraka Dispensary
28	Wanyonyi	0713985964	Human Resources Rai Paper
29	Fred Nalika		
30	Franco Sikanga		

31	Nga'ng'a		
32	Truphosa Taracha	0735953328	Contact person
33	Timothy Khalama		
34	Veronica Makokha		
35	Sarah Nafula		
36	Grace Namwenya		
37	Asha Muchende		
38	Lilian Edward		
39	Deporah Wasike		
40	Mary Barasa		
41	Jotham Mafunga		
42	Joseph Mulati		
43	Fred Wafula		
44	Emmanuel Wafula		
45	Milton Ayonge		
46	Isaac Karume		
47	Emmanuel Situma Sikanga		

Venue for Public Participation

The identified venue will be MCA hall near Nabyole shopping centre. The needs for the venue setting are; Sanitizers, Masks, hand washing soap and hand washing water. Spacing at the sitting area is planned to follow strictly the protocols given by the Ministry of Health on prevention of COVID-19. Water and soda will be served to the attendants during the meeting

Public Participation Presentation

Presentation during the public participation meeting will be facilitated through;

a) Maps and plans for the project layout
b) Flip charts for discussion and
c) Administration of the questionnaires

Translator will be used where issues need to be translated in mother tongue

Emerging Issues

The following issues arose during the mobilization exercise and need to be addressed during public participation:

1. How soon the proposed hydro power project is expected start?

2. Is there any more land that will be required when the projects starts?
3. Is road size enough for big Lorries and machinery?
4. How will the community benefit from the proposed projects?
5. Which challenges will the proposed project bring to the community?
6. Will those people with trees along the road be compensated if the road needs to be expanded?
7. Where will the produced power pass?
8. Will the people on the other side of the river be affected by the proposed project?
9. Will the proposed project affect the intake of Rai paper factory?

15.1.2. Appendix 1.2: MINUTES OF PUBLIC PARTICIPATION MEETING HELD ON MARCH 9th, 2021: FOR NZOIA II SMALL HYDROPOWER PLANT (20 MW)

Venue: Fall View Hotel Hall, Webuye Town, Kenya

Time: 9:00am – 12 Noon

I. LIST OF ATTENDANTS

1. Prof BNK Njoroge
2. Mr. Francis Muturi
3. Mr. Peter Ndirangu
4. Mr. Edwin shivach
5. Samuel Katoi - Chief Chetambea location
6. Samuel Kisuya - Chief Muchi location
7. Annet N. Makale - Assistant chief Mitukuyu sub-location
8. Alex Mukwei - Assistant chief Mihuu sub-location
9. Other Attendants as listed on the Attendance List (Appendix 1)

II. Meeting Objectives

The objectives of the meeting were;

a) To sensitize the community within the Project area on the proposed NZOIA II Hydropower plant.

b) To discuss with the Project area community on possible impacts of the proposed Hydropower project

c) To build consensus with the project area community about the benefits of the proposed Project

III: MINUTES

Introduction

The meeting was opened by village elder Janet Muyekho at 10: 00

- Janet introduced herself as the area community leader
- Janet reminded attendees to sign the attendance register and requested Melvis Wekesa to lead with a chorus and pastor to open with a word of prayer
- Janet welcomed Mr. Francis Muturi

Mr. Francis Muturi thanked everyone for their attendance at the meeting and presented the Agenda of the meeting as follows:

- Introduction
- Presentation of the Proposed Project
- Discussion
- Introduction to questionnaire
- Closing prayer
- Closure

Mr.Muturi requested the attendees to introduce themselves individually

Presentation

After introductions Mr Muturi invited Prof Bernard Njoroge to introduce himself and present the proposed Hydropower Project

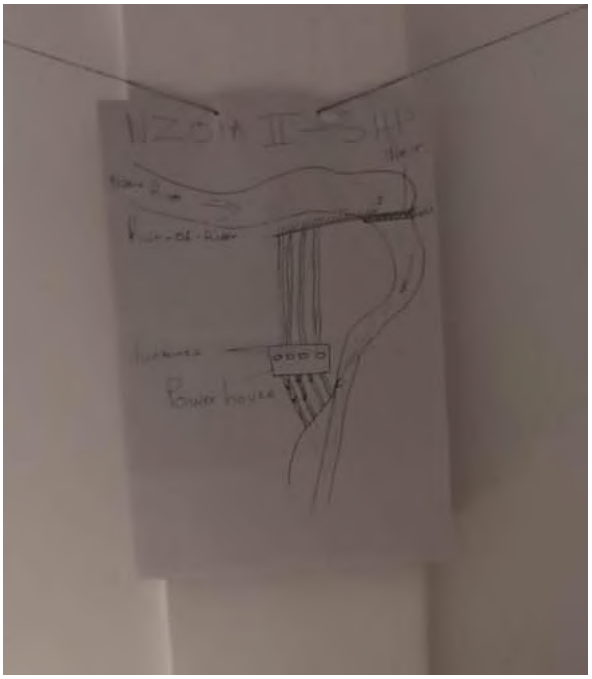
Summary

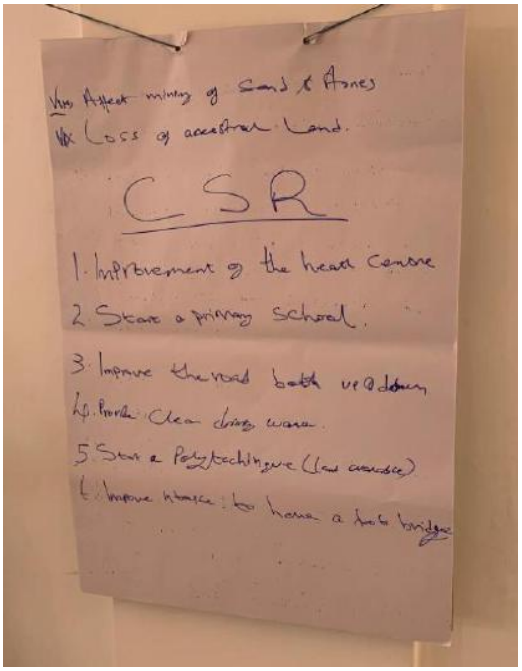
Prof BNK Njoroge's Presentation

Prof Njoroge presentation included the chronology of the project since its conception, during the land purchase, the sensitization of the Project to the area community which was conducted two weeks prior to the public consultation meeting.

The presentation of the proposed small hydropower project 20.0 MW was done in three phases namely;

- The background and feasibility study findings that led to need of a hydropower station in the area
- Then he explained in details the proposed hydropower project plan and design
- Presentation of the construction details of the 20MW small hydropower project (SHPP)
- The Environmental and social impact of the proposed Hydropower with emphasize that SHPP are preferable due to their low negative impacts
- The GoK through Ministry of Energy is promoting the construction of SHPP across the country
- The western region having lowest electrical power coverage in the country despite its potential in agricultural (sugar industry) paper (Webuye), tourism (cottages), education, etc.





Discussion

Mr. Muturi raised a question of possible **Positive Impacts** for the proposed small hydropower project. The community gave the following as **Positive Impacts:**

- Project will offer employment opportunities to some member of the community
- Power will be available to their homes
- The project will open the economy of the area
- The project will improve security in the area
- People will start small industries
- Improvement of infrastructure of the area
- Project will improve quality of drinking water
- Agricultural sector will improve

- Businesses will grow in the area
- The project will act as tool bank for women and youth
- The hydropower will attract tourists
- The hydropower will act as educational site
- Technology of the area will improve
- The culture will be advertised nationally and internationally
- The project will enhance proper utilization of natural resources in the area

Mr. Muturi raised a question of possible **Negative Impacts** for the proposed small hydropower project. The community gave the following as **Negative Impacts**:

- People will be restricted from getting to project area
- There will be pollution during construction
- The project may influence availability of drinking water
- Ecosystem of the area may depreciate
- Project will affect mining of sand and stones

Mr. Muturi raised a question of possible **CSR**. The community gave the following as possible **CSR** projects:

- Upgrading of Maraka dispensary
- Building a primary school
- Upgrade the both roads heading to the site
- Start a polytechnic (land is available)
- Design the weir to act as a foot bridge
- Lighting the area to improve security

Mr. Muturi introduced a questionnaire that was to be filled by a random sample of the community on Thursday 11th march 2021. Six questionnaires were to be filled in Mihuu location while four questionnaires were to be filled in Maraka location. A sample of the questionnaire is attached in appendix 2

Conclusion and closing remarks

The project got overwhelming support from both the administration and the community at large. Samuel Katoi chief Chetambea location while giving his closing remarks on behave of the administration said that, during the sensitization exercise he advised Mr. Muturi and Mr. Edwin to brief DCC Webuye about the proposed project, which he noted they did. On meeting the DCC he briefed him that the Government supports the proposed project and that chiefs and the assistant chiefs should give the project proponents necessary support which they require. The chief remarked to the community that, project such like the proposed hydropower will bring a good name to the area and that they should be ready to support such projects in the future. He also advised those who sold the land to move from the land with immediate effect to pave way for the project preparations to start.

The community in unison replied to Mrs Daraja while giving closing remarks on behave of the community that they support the project and it should start immediately mainly to give employment opportunities especially to the youths.

Mr. Edwin Shivach while giving closing remarks on behave of project proponents appreciated the good hospitality given by the community throughout the exercise and said that due to the ministry of health advice on public meeting, lunch/tea will be facilitated where the attendees would buy/prepare own food.

End

Janet Muyekho requested pastor to close with prayer and the meeting ended in an upbeat and cordial atmosphere.

15.1.3. Appendix 1.3: List of the ATTENDANCE FOR THE PUBLIC PARTICIPATION HELD ON 9th March. 2021 for NZOIA II 20 MW Small Hydropower Plant

BUNGOMA PROPOSED HYDROPOWER PROJECT ATTENDANCE LIST

S/NO	NAME	ID NO	SIGNATURE
1	Joseph Chimakile	5615987	
2	Jessey Matanda	5792579	
3	Gilbert Situma		
4	Mary Nyamiti	13434824	
5	Gladyce Sikanga	11330797	
6	Geofrey Shiundu	14657217	
7	Moses Barasa	0722364	
8	Jacob Kakai		
9	Beatrice Chilande	26608572	
10	Andew Sikanga		
11	Kinsly Mutali		

12	Melvis Wekesa	35680463	0743761437	[signature]
13	Jane Akinyi	36919265	0792578341	[signature]
14	Paul/ Ben			
15	Amos Biketi	22418095	0725476418	[signature]
16	Emanuel Situma * No 47			
17	Elizabeth Wanyonyi	7611466	0717094652	EW
18	Margret Wayeko	9512732	0758745675	[signature]
19	Jacob Werunga	7593506	0710337245	[signature]
20	Janet Muyekho COORDINATOR.	23318571	0724840120	Jsu
21	Samuel Kisuya	11656681	0723062469	[signature]
22	Mukwei ALEX	22386721	0748785412	[signature]

23	Josphine Mukhwana ASS'T CHIEF MUCHI LOCATION MALAKHA WARD	23264938	0712148338	[signature]
24	Joseph MULATI	23022202	0112237539	[signature]
25	Nyamawi Chaka			
26	Leah Mutali			
27	Isaac Karume	1949015	0707550495	[signature]
28	Wanyonyi ANDREW	8768880	0729212282	[signature]
29	Fred Nalika	32528831	0798820860	[signature]
30	Franco Sikanga	32528861	0789910890	[signature]
31	Nga'ng'a RICHARDSON	29450991	0706818677	[signature]
32	Truphosa Taracha	5640187	0722647977	[signature]
33	Timothy Khalama	28708415	0746379024	[signature]
34	Veronica Makokha	20653920	0115364970	[illegible]

35	Sarah Nafula/MARGARET LOKIYAMA		
36	Grace Namwenya	6673675	0706725912
37	Asha Muchende	23244486	0798652507
38	Lilian Edward	32255044	0797457857
39	Deporah Wasike	14611012	0707176602
40	Mary ~~Barasa~~ WAFULA	26065865	0717420139
41	Jotham Mafunga		
42	Joseph ~~Mulati~~ NUKUGTI	23655315	0710444244
43	Fred Wafula	19455773	0727784231
44	Emmanuel Wafula	7993379	0728363471
45	Milton Ayonge		
46	Isaac Karume		

47	Emmanuel Situma Sikanga	9945274	0724758144	[illegible]
48	Herman Namiti	8983244	0726652606	[illegible]
49	JOTHAM TARACHA	4383151	0719234625	[illegible]
50	CHRISTINE MAUWA	14722598	0724-205737	[illegible]
51	Luke Kapchanga (Rus)	9996278	0733998526	[illegible]
52	XMTA SCHOOL N. WEKESA	20270292	0723245268LI	[illegible]
53	DOMINIC NAALILA	4723486	0780245747	[illegible]
54	PETER M WASI	4383833	0723045472	[illegible]
55	NICKSON NABIBIA	13316642	07415985[illegible]	[illegible]
56	Norah Naliaka	32924378	0758551287	[illegible]
57	Isaac Kisiangani ASST CHIEF MITUKUYU SUB LOC	37265590	0762841436	[illegible]
58	ARONGE N. MAKALE	11564443	0727-778976	[illegible]
59	CHIEF CHETAMBEA LOCATION SAMUEL KATOI	0724310127	8740013	[illegible]
60	Mary Naliaka	0646066	0711323437	[illegible]
61	BEATRICE BUSWETI		0707980212	[illegible]
62	Bill Wanyama	38146694	0745882832	[illegible]
~~63~~	~~JOSEPHINE N MUKHWANA~~			
63	MOSES LUKOA	07993849	0796971531	[illegible]
64	NAMANJA NASILA	0760337730	12849707	[illegible]
65	ANN N. ARAB	0719425	11563255	[illegible]
66	CAROLINE NJIUKE	0792613804	245753	[illegible]

7/03/2021

15.2. Appendix 2: Brief Overview of Environmental Legislative Framework

The Constitution of Kenya, 2010

Article 32 of the Constitution of Kenya states that "Every person has the right to a clean and healthy environment", which includes the right-

a) to have the environment protected for the benefit of present and future generations through legislative and other measures particularly those contemplated in Article 69; and

b) to have obligations relating to the environment fulfilled under Article 70. The obligations in respect of the environment as stated in Article 69 of The Constitution include:

(1) The State shall –

a) ensure sustainable exploitation, utilisation, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;

b) work to achieve and maintain a tree cover of at least ten percent of the land area of Kenya;

c) protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and genetic resources of the communities;

d) encourage public participation in the management, protection and conservation of the environment;

e) protect genetic resources and biological diversity;

f) establish systems of environmental impact assessment, environmental audit and monitoring of the environment;

g) eliminate processes and activities that are likely to endanger the environment; and

(2) utilise the environment and natural resources for the benefit of the Kenyan people.Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

This obligation therefore makes it mandatory to the way in which proposed project would affect the environment.

Environment Management and Co-ordination Act 1999

The Environment Management and Co-ordination Act 1999, is the legislation that governs Environmental Impact Assessment (EIA) studies in Kenya. The Act requires that EIA for power generating projects carry out an EIA as per the second schedule of the Act. The Jiatian (Kenya) Company Ltd, the Proponent of the 20 20MW SHP endeavours to adhere to the provisions of this schedule.

This schedule lists the projects required to undergo EIA studies in accordance with section 58(1), (2), (3) and (4) of the Act. Electrical infrastructure is covered in Part 10 of this schedule and this includes electrical transmission lines and electrical sub-stations.

The Act set-ups the National Environmental Management Authority (NEMA) whose objective and purpose is to perform general supervision and coordination over all matters relating to the environment and to be the principal instrument of the Government in the implementation of all policies relating to the environment.

With the introduction of Environment Impact Assessment and Audit Regulations, (2003) issued through the Kenya Gazette Supplement No. 56 of 13 June 2003, the submission of environmental reports became mandatory. According to these regulations no proponent shall implement a project likely to have a negative environmental impact or one for which an EIA has been concluded and approved in accordance with these regulations.

The Environment (Impact Assessment and Audit) Regulations 2003 and Environmental impact Assessment and Audit 9Amendment) Regulations 2019.

The Environmental and Social Impact Assessment (ESIA) is a critical examination of the effects a project have on the environment. The goal of an ESIA is to ensure that decisions on proposed projects and activities are environmentally sustainable. An EIA is conducted in order to identify impacts of a project on the environment, predict likely changes on the environment as a result of the development, evaluate the impacts of the various alternatives on the project and propose mitigation measures for the significant negative impacts of the project on the environment.

The ESIA also generates baseline data for monitoring and evaluating impacts during the project cycle as well as highlighting environmental issues with a view to guiding policy makers, planners, stakeholders and government agencies to make environmentally and socio-economically sustainable decisions. It seeks to minimize adverse impacts on the environment and reduces risks. ESIA also identifies measures to mitigate the negative impacts while maximizing on the positive ones.

Environmental Audit (EA) is the systematic documentation, periodic and objective evaluation of activities and processes of an ongoing project. The goal of EA is to establish if proponents are complying with environmental requirements and enforcing legislation. The purpose of EA is to determine the extent to which the activities and programs conform to the approved environmental management plan.

EMCA (Noise and Excessive Vibration Pollution Control), 2009

According to the Act no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

The regulations prohibit excessive noise and vibration. It states that no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. The contactor will have to observe that no such noise is made during the construction works.

Table 3.1 displays the maximum permissible noise levels in Kenya. Values range from 35 dB(A) at night to 60dB(A) during the day. Note that the IFC has slightly different noise

ratings (Table 3.2).

Table 3.1Maximum Permissible Noise levels in Kenya

Zone		*Sound Level Limits dB(A)* (Leq,14 h)		*Noise Rating Level (NR)* (Leq,14 h)	
		Day	Night	Day	Night
A.	Silent Zone	40	35	30	25
B	Places of worship	40	35	30	25
C.	Residential : Indoor	45	35	35	25
	Outdoor	50	35	40	25
D.	Mixed residential (with some commercial and places of entertainment)	55	35	50	25
E.	Commercial	60	35	55	25

Time Frame

Day: 6.01 a.m. – 8.00 p.m. (Leq. 14 h)
Night: 8.01 p.m. – 6.00 a.m. (Leq, 10h)

Table 3.2 Maximum Permissible Noise levels from the IFC standards

Receptor	One Hour L_{Aeq} (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational[55]	55	45
Industrial; commercial	70	70

In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

a) Time of the day
b) Proximity to residential area
c) Whether the noise is recurrent, intermittent or constant;
d) The level and intensity of the noise
e) Whether the noise has been enhanced in level or range by any type of electronic or mechanical means
f) Whether the noise can be controlled without much effort or expense to the person making the noise.

Motor vehicles used during the construction should adhere to the regulations which prohibit excessive noise. The provision of the Act on motor vehicle states that no person shall operate a motor vehicle which-

a) produces any loud and unusual sound;
b) Exceeds 84 dB (A)when accelerating;
c) No person shall at any time sound the horn or other warning device of a vehicle except when necessary to prevent an accident or an incident; and
d) The provisions of the Traffic Rules shall apply to this Regulation.

Any person carrying out construction, demolition, mining or quarrying work shall ensure that the vibration levels do not exceed 0.5 cm/s beyond any source property boundary or 30 metres from any moving source.

Waste Management Regulations, 2006 (Legal Notice No.121)

Waste Management Regulations are meant to streamline the handling, transportation and disposal of various types of waste. The aim of the Waste Management Regulations is to protect human health and the environment. Currently, different types of waste are dumped haphazardly posing serious environmental and health concerns. The regulations place emphasis on waste minimization, cleaner production and segregation of waste at source.

The regulations have classified various types of waste and recommended appropriate disposal methods for each waste type. Under the Waste Management Regulations, NEMA licenses transporters, incinerators, landfills, composers, recyclers and transfer stations. Facilities to be licensed include local authorities, transporters and handlers of various types of waste. The licensing employs a risk-based approach by concentrating on facilities considered to pose a

high risk to the environment.

Proper disposal of wastes shall be observed by the contractor during the wind power plant construction. This is aimed at sustaining good hygiene and proper working environment.

EMCA (Wetlands, River, Lake and Sea) Regulations, 2009

The Act applies to all wetlands in Kenya whether occurring in private or public land. The objectives of the act is to provide for the conservation and sustainable use of wetlands and their resources in Kenya and promote the integration of sustainable use of resources in wetlands into the local and national management of natural resources for socio-economic development. It also aims at ensuring the conservation of water catchments and the control of floods and the sustainable use of wetlands for ecological and aesthetic purposes for the common good of all citizens. Further the act makes provision for the protection of wetlands as habitats for species of fauna and flora and provision of a framework for public participation in the management of wetlands.

The Wetland resources shall be utilized in a sustainable manner compatible with the continued presence of wetlands and their hydrological, ecological, social and economic functions and services. Special measures shall be essential to promote respect for, preserve and maintain knowledge innovations and practices of indigenous and local communities embodying traditionallifestylesrelevantfortheconservationandsustainableuseofbiological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices. Sustainable use of wetlands shall be integrated into the national and local land use plans to ensure sustainable use and management of the resources.

EMCA (Biological Diversity and Resources, Access) Regulations, 2006

The Act provides that no person shall engage in any activity that may have an adverse impact on any ecosystem; may lead to the introduction of any exotic species or to unsustainable use of natural resources, without an Environmental Impact Assessment License issued by the Authority under the Act.

The Authority shall, in consultation with the relevant lead agencies, impose bans, restrictions or similar measures on the access and use of any threatened species in order to ensure its regeneration and maximum sustainable yield.

Physical Planning Act (No. 6 of 1996)

This Act of Parliament provides for the preparation and implementation of physical development plans and for connected purposes.

Section 36 of this Act provides for EIAs and states that:-

If in connection with a development application a local authority is of the opinion that proposals for industrial location, dumping sites, sewerage treatment, quarries or any other development activity will have injurious impact on the environment, the applicant shall be required to submit together with the application an EIA report.

The Forest Act 2005

This is an Act of Parliament to provide for the establishment, development and sustainable management, including conservation and rational utilization of forest resources for the socio - economic development of the country: Recognizing that forests play a vital role in the stabilization of soils and ground water, thereby supporting the conduct of reliable agricultural activity, and that they play a crucial role in protecting water catchments in Kenya and moderating climate by absorbing greenhouse gases; and further recognizing that forests provide the main focus of Kenya's biological diversity and a major habitat for wildlife while acknowledging that forests are the main source of domestic fuel wood for the Kenyan people, and that they provide essential raw materials for wood based industries and a variety of non-wood forest products. Though the Act does not itself define 'forests' the Kenya Forest Service defines forests as "land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy of more than 10 percent." The proposed project will not have impact as described in this Act as the area project site is not a forest but agricultural land.

The Water Act of 2002

This is an Act of Parliament to provide for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services; to repeal the Water Act (Chapter. 372 of the Laws of Kenya) and certain provisions of the Local Government Act; and for related purposes.

In addition to this act and in furtherance of the said related purposes the Minister for Water and Irrigation, through the powers conferred to him by Sections 47(6) and 110(1) of the

Water Act, 2002, made THE WATER (WATER SERVICES LEVY) REGULATIONS, 2008. This sought to impose a levy of one per cent (1%) of all sales of water services to consumers by each water service provider operating under the Act.

The Water Act, in general, gives provisions regarding the ownership of water, institutional framework, national water resources, management strategy, and requirement for permits, state schemes and community projects. Part IV of the Act addresses the issues of water supply and sewerage. Section 59 of the Act states that the National Water strategy shall contain details of:-

- Existing water services.
- The number and location of persons who are not being provided with basic water supply and basic sewerage.
- Plans for the extension of water services to underserved areas.
- The time-frame for the plan; and
- An investment programme.

The Energy Act

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

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

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

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

However, a permit shall not be required in the case of installations with a generating plant of a capacity not exceeding 1000 kW and connected within the premises of any person in such a

manner that conveyance of electrical energy to a transmission system or a distribution system cannot occur.

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

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

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

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

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

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

A licensee shall, not less than thirty days before exercising this power, give notice in writing

to the owner of his intention to do so, except in a case of emergency and in such case the licensee shall notify the owner as soon as possible after the emergency has arisen.

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

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

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

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

Electric Power Act (Act No. 11 of 1997)

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

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

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

Standards or where no such standards exist, to comply with the relevant International Standards approved by the Kenya Bureau of Standards.

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

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

Kenya Electricity Grid Code & Kenya Safety Code

The Kenya Electricity Grid Code sets out detailed arrangements for the regulation of the Kenyan electricity supply industry and is enforceable under the Electric Power Act (No. 11 of 1997). The Kenya Safety Code recognizes the Factories Act (1962) which requires an employee to use any means or appliance provided by the employer for securing safety and also wilfully to do anything to endanger himself or others.

Occupational Safety and Health Act 2007(CAP 15)

This Act came into operation in the year 2008. The Act applies to all workplaces where any person is at work, whether temporarily or permanently. The purpose of

The act is to secure the safety, health and welfare of persons at work; and protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work.

Section 19 of the Act provides that an occupier of any premises likely to emit poisonous, harmful, injurious or offensive substances, into the atmosphere shall use the best practicable means to prevent such emissions into the atmosphere; and render harmless and inoffensive the substances which may be emitted.

Section 16 provides that no person shall engage in any improper activity or behaviour at the workplace, which might create or constitute a hazard to that person or any other person.

The Public Health Act (Chapter 242 of the Laws of Kenya)

This Act of Parliament makes provisions for securing and maintaining health. It contains directives that affect human health. Section 3 of the Act establishes the Central Board of Health which shall consist of the Director of Medical Services (who shall be chairman), a sanitary engineer, or such person as may be appointed by the Minister to perform the duties of sanitary engineer, a secretary, and such other person or persons not exceeding six (three of whom shall be medical practitioners) as are appointed from time to time by the Minister.

There are provisions within the Act to deal, in a general way, with water, air and noise quality as they pertain to human health. An environmental nuisance is defined and includes the emission from premises of wastewaters, gases and smoke which could be regarded as injurious to health. The owner and/or occupier of premises responsible for such nuisances are liable to prosecution under the Act.

Agriculture Act (Chapter 318 of the Laws of Kenya)

This statute seeks to promote and maintain a stable agriculture, to provide for the conservation of the soil and its fertility and to stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry.The Minister administering the Act, after concurrence with the Central Agricultural Board and consultation with the County Agricultural Committee, can impose land conservation orders on lands to control cultivation, grazing and clearing. These controls may be necessary to protect the land against soil erosion, to protect fertility, and to maintain catchments. Local authorities are generally empowered to administer these sections of the Act and the District Agricultural Committee is entitled to make regulations relating to these controls.

Agricultural Rules are prescribed under the Act, whereby vegetation clearing in steep slopes areas or adjacent watercourses, without authorization, is controlled.

Wildlife (Conservation and Management) Cap 376 Laws of Kenya

This Act of Parliament deals with the consolidation and amendment of the law relating to the protection, conservation and management of wildlife in Kenya; and for purposes connected there with and incidental thereto.

The act provides that where it is desirable that the present powers relating to the management and conservation of wildlife in Kenya should be amalgamated and placed in a consolidated Service of the Government and the prime objective of the Service should be to ensure that wildlife is managed and conserved so as to yield to the Nation in general and to individual

areas in particular, optimum returns in terms of cultural, aesthetic and scientific gains as well as such economic gains as are incidental to proper wildlife management and conservation and which may be secured without prejudice to such proper management and conservation.

For the achievement of the objective, that full account should be taken of the varied forms of land use and the inter-relationship between wildlife conservation and management and other forms of land use.

The Act controls activities within the park, which may lead to the disturbance of animals. Unauthorized entry, residence, burning, damage to objects of scientific interest, introduction of plants and animals and damage to structure are prohibited.

Land (Group Representatives) Cap 287 of the Laws of Kenya

This is an Act of Parliament to provide for the incorporation of representatives of groups who have been recorded as owners of land under the Land Adjudication Act, and for purposes connected therewith and purposes incidental thereto. This Act is not relevant in this project as the land on which the proposed project is to be located is privately owned land.

Way leaves Act (Chapter 292 of the Laws of Kenya)

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

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

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

In Kenya we have a plethora of enactments all governing land and transactions in land. Thus the substantive land law is to be found in two different statutes while the adjectival land law

is to be found in five different statutes not forgetting the customary land law of the various tribes in Kenya.

(i) Systems of Substantive Land Law

There are two systems of substantive land law in Kenya these are:

- The Indian Transfer of Property Act 1882 as amended by the 1959 Amendment Act. This Act sought to amend the law relating to the transfer of property by act of parties, whereby the transfer of property means an act by which a living person conveys property, in present or in future, to one or more other living persons, or to himself, or to himself and one or more other living persons.
- The Registered Land Act (Chapter 300 of the Laws of Kenya.) The intention of this Act of Parliament is to make further and better provisions for the registration of title to land, and for the regulation of dealings in land so registered, and for purposes connected therewith.

(j) Conveyance systems

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

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

(k) Registration Systems

The five registration systems are those under: -

- The Government Lands Act (G.L.A.)
- The Registration of Titles Act (R.T.A)
- The Land Titles Act (L.T.A)
- The Registration of Documents Act (Chapter 285 of the Laws of Kenya): This is an Act of Parliament to provide for the registration of documents. It states that: all documents conferring, or purporting to confer, declare, limit or extinguish any right, title or interest, whether vested or contingent to, in or over immovable property (other than such documents as may be of a testamentary nature) and vakallas shall be registered. It should be noted that this Act isn't peculiar to Land Law, as documents completely unrelated to land can be registered under it.
- The Registered Land Act (R.L.A)

(l) Land Ownership

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

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

On conversion or expiry of the Lease, a new grant may be issued under The

or the R.T.A. All un-alienated land other than trust land and all revision of Government leases are vested in the Government, other lands whether held on freehold or leasehold are vested in the grantees as owners having the rights over them.

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

Section 117(4) stipulates that the setting apart of such land is void unless the law under which it is made makes provision for the prompt payment of full compensation. The Trust Land Act, in Sections 7 to 13, makes provisions for the setting apart of land and payment of compensation with regard thereto. All land in urban areas of Kenya and much of the land in rural areas has a registered title. The title to land is either freehold or leasehold. The development and use of freehold title is controlled by land planning regulations which are administered by both the Central Government and the Local Authority in which the Land is situated. A local Authority is either a County Council or a Municipal Council whose activities are established and controlled by the Local Government Legislation.

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

Local Government Act (Chapter 265 of the Laws of Kenya)

This is an Act of parliament, which provides for the establishment of authorities for local government; to define their functions and to provide for matters connected therewith and incidental thereto. The Act is connected with a wide range of matters that affect the day-to-day activities of individuals and organizations.

Section 163A of this Act gives the local authority the power to grant business permits. It states that a local authority may on receipt of an application under this Act grant a business permit to allow the conduct of a business or trade, including

a profession or occupation within its area. Provided that in the case of a business, trade, profession or occupation regulated by the provisions of any other written law, a person shall prior to the submission of an application for a business permit pursuant to this subsection, satisfy all the requirements of that other written law.

Section 163 is another important part of the Act it gives every town council and urban council power, to control or prohibit all businesses, factories and workshops which, by reason of smoke, fumes, chemicals, gases, dust, smell, noise, vibration or other cause, may be or become a source of danger, discomfort or annoyance to the neighbourhood, and to prescribe the conditions subject to which such businesses, factories and workshops shall be carried on.

Section 145 of the Act is concerned with the miscellaneous powers of local authorities subsection (w) empowers local authorities to take measures that may be necessary or desirable for the preservation or protection of wildlife, and provide amenities for the observation of wildlife. Section 146(d) empowers a local authority, with the consent of the Minister to make grants for the establishment and maintenance of game parks and other related facilities. Section 147(d) controls the cutting of timber and the destruction of trees and shrubs.

Under section 265(1) of the Act, any officer of a local authority duly authorized in writing shall, on producing, if so required, some duly authenticated document showing his authority, have a right to enter any premises at all reasonable hours for the purpose of ascertaining whether there is, or has been, on, or in connection with, the premises, any contravention of this Act or of any by-laws, whether made under this Act or any other written law, being provisions which it is the duty of the local authority to enforce.

The Trust Land Act (Chapter 288)

This is an Act of Parliament which makes provision for Trust land. Section 38(1) of the Act provides that a way leave license may be granted to any person empowering him and his servants and agents to enter upon Trust land vested in

the council and to lay pipes, make canals, aqueducts, weirs and dams and execute any other works required for the supply and use of water, to set up electric power or telephone lines, cables or aerial ropeways and erect poles and pylons therefore, and to make such excavations as may be necessary for the carrying out of any such purposes, and to maintain any such works as aforesaid.

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

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

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

Before granting any such way leave license, the council shall satisfy itself that compensation in respect of disturbance or of any other loss or expenses likely to be caused by the erection or laying of the electric line has been or will be paid to those concerned in like manner and to the same extent as if the land had been set apart under the Act and as if the compensation were being paid under section 8 of the Act. No such way leave license shall be valid for a longer period than the period of validity of the relevant license issued under the Electric Power Act.

The annual fee to be paid for such a way leave license shall be assessed at 25 cents per annum per pole or pylon, or, where the electric line is laid underground, Sh. 5 per mile.

The Valuers Act Chapter 532

The revised edition 1985 of the valuers Act Cap 532 makes provisions for the relevant charges and conducts of valuers in relation to valuation of assets. This act help protects these people by providing the relevant regulations and guidelines in the undertaking of the valuation works.

The Penal Code (Cap. 63) [Rev 2018]

The chapter on “Offences Against Health and Conveniences” contained in the Penal Code

enacted in 1930 strictly prohibits the release of foul air into the environment, which affects the health of other persons. Any person who voluntarily violates the atmosphere at any place, to make it noxious to health of persons in general dwelling or carrying out business in the neighbourhood or passing along public ways is guilty of misdemeanour,

i.e. imprisonment not exceeding two years with no option of fine. Under this code, any person who for the purpose of trade or otherwise makes loud noise or offensive awful smell in such places and circumstances as to annoy any considerable number of persons in the exercise of their rights, commits an offence, and is liable to be punished for a common nuisance, i.e. imprisonment not exceeding one year with no option of fine.

The Radiation Protection Act (revised 1985)

The act makes provisions for the manufacture or otherwise produces or possess or use or either sell, dispose of or lease, loan or deal with or import or cause to be imported; or any irradiating device or radioactive material except under and in accordance with a licence issued under this Act. The act states that no person shall sell an irradiating device or radioactive material unless at the time of sale the purchaser produces to the vendor a valid licence authorizing him to use that type of irradiating device or radioactive material.

An irradiating device or radioactive material shall be deemed to have been exported when it is placed on a ship, aircraft, train or any other vehicle within Kenya for the purposes of export.The Limitation of Actions Act Cap 22

An Act of Parliament to prescribe periods for the limitation for actions and arbitrations, and to make provision concerning the acquisition of easements by prescription, and for matters incidental thereto and matters connected therewith.

The act makes provision for the extension of the periods of limitation in the case of disability, acknowledgement, part payment, fraud, mistake and ignorance of material facts.

The Employment Act, 2007 [amendment Act 2019]

An Act of Parliament to repeal the Employment Act, declare and define the fundamental rights of employees, to provide basic conditions of employment of employees, to regulate employment of children, and to provide for matters connected with the foregoing.

The contractor on-site will have to employ casuals probably from the communities where the road traverses and also other workers during construction and operation. The basic conditions of employees should be observed to avoid unnecessary conflicts during the construction

works.

The Contractor shall pay the entire amount of the wages earned by or payable to the workers. Payment of such wages should be done at the end of a working day at or near the place of work.

The Lake and Rivers Act Cap 409

The Act makes provision for regulating the use of lake or river for the transport of floating timber; regulating the traffic on a lake or river; for protecting the bird or animal life on or in a lake or river.

REPUBLIC OF KENYA

THE LAND REGISTRATION ACT

(*No.* 3 *of* 2012, *section* 108)

THE REGISTERED LAND ACT

(*Chapter* 300) (REPEALED)

Title Deed

Title Number NDIVISI/MIHUU/4886

Approximate Area (3.55) HA

Registry Map Sheet No. 16

This is to certify that NJOROGE NJERI KIMANI BERNARD

ID/No. 4830517 P O BOX 64683 NAIROBI

is (are) now registered as the absolute proprietor(s) of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 28 of the Land Registration Act (No. 3 of 2012) as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the

BUNGOMA District Land Registry

this 13TH day of NOVEMBER, 20 20

Land Registrar

(To be completed only when the applicant has paid the fee of Sh. 125)

At the date stated on the front hereof, the following entries appeared in the register relating to the land:

EDITION: 1 OPENED: 9.11.2020	**PART A—PROPERTY SECTION**	
REGISTRATION SECTION	EASEMENTS, ETC.	NATURE OF TITLE
NDIVISI/MIHUU		
PARCEL NUMBER		
4896		
APPROXIMATE AREA		ABSOLUTE
3.55 Ha.		
REGISTRY MAP SHEET No.		
16		

PART B—PROPRIETORSHIP SECTION

COMBINATION OF PLOT NOS. 3460, 4857, 2454, 4854, 4861, 4860, 3750 & 4085

ENTRY No.	DATE	NAME OF REGISTERED PROPRIETOR	ADDRESS AND DESCRIPTION OF REGISTERED PROPRIETOR	CONSIDERATION AND REMARKS	SIGNATURE OF REGISTRAR
1	9.11.2020	NJOROGE NJERI KIMANI	BOX ABD ID/NO. 4830517		[signature]
2	12.11.2020	TITLE	DEED	ISSUED	

PART C—ENCUMBRANCES SECTION

ENTRY NO.	DATE	NATURE OF ENCUMBRANCE	FURTHER PARTICULARS	SIGNATURE OF REGISTRAR

Land Registrar

REPUBLIC OF KENYA

THE LAND REGISTRATION ACT

(*No.* 3 *of* 2012. *section* 108)

THE REGISTERED LAND ACT

(*Chapter* 300) (REPEALED)

Title Deed

MLS/TD/02/A2/02 **No.** 3172333

GPK (SP) 7164—600m—16/2017

Appendix 15.2.5 Selected Filled questionnaire FOR NZOIA II 20 MW SMALL HYDROPOWER PLANT

Ward MIHUU'	**Constituency** VIHIUYE EAST
Location CHETAMBE	**Sub-location** MIHUU'
Date of Interview 11/3/2021	
Start time	**End Time**

Questionnaire Number

001

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name JANE AKINYI
2. Respondent's name JANET M MUYEKHO
3. Respondent's Address 370 KEBUKE
4. Respondent's telephone number 0724 840120
5. Respondent's Email Address
6. Respondent's Signature

DEMOGRAPHIC DATA

1. Head of Household's Name Jacob I. EKESA
2. Sex: Male (✓) Female( )
3. Tribe LUYA MACHONI
4. Occupation PEASANT FARMER
5. Religion CHRISTIAN
6. Total Household members 11
7. Education level of head of household (**Tick appropriately**)
   a) Primary (✓)
   b) Secondary ( )
   c) College/ University ( )

X8. Total household members
9. What is your main source of income? generating small business

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 20yrs
2. What is the size of your land? 1 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase (✓)
   b) Inheritance ( )
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent ( )
   b) Semi-permanent (✓)
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River ( )
   b) Well ( )
   c) Dam ( )
   d) Tap (✓)
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals ( )
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 1KM.
b) Health Centre 5km
c) Public hospital 10km
d) Private hospital 9km
e) Social hall 7km
f) Playing field 5KM

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	subsistance	1½	15 bags	3000/=
c)	Millet ✓	subsistance	50 by 100	1 bag	200per 2kg
d)	Cassava				
e)	Beans ✓	subsistance	1½	1 bag	150/-
f)	Groundnuts				
g)	Bananas ✓	Sale	100 by 50	10	500/=
h)	Vegetables ✓	sale	½	4 bags	250/=
i)	Potatoes ✓	subsistance	100 by 50	2 bags	200/=
j)	Peas				
k)	Onions / tomatoes	sale	0.25	10 crates	3000/-
l)	Wheat				
m)	Sorghum ✓	subsistance	50 by 50	½ bags	150
n)	Fruits (Specify) orange	subsistance	5 branch	80per bra	10/=
o)	Others (Specify)				
p)					

DUCKS - 10 — 500 per duck
HEN - 3 — 500

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow			
b)	Bull ✓	4	For Farming	2,000 per each
c)	Sheep			
d)	Goats ✓	1	for Milking	70 per Litre
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry ✓	10	Egg Production	1 CRATE 320/=
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓		✓	
b)	Bilharzia			
c)	Typhoid ✓			occasionally
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease ✓		✓	
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia ✓		✓	
l)	COVID-19			
m)	Others(Specify)			occasional
n)	CHEST Problem			
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital (✓)
b) Dispensary ( )
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 3KM
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes (✓)

No ( )

2. Is your house connected to grid power?

Yes (✓)
No ( )

If not, why?

.....

.....

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity ✓		✓		✓		2000/=
Kerosene						
Charcoal ✓	✓					1000 per [2 bags]
LPG Gas						
Biogas						
Firewood ✓	✓					200 per day
Wind						
Solar						

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Power suption.
   b. Power Conduction of Electricity.
   c. Firewood and charcoal is high.
   d. .....

5. What are the suggested solutions?
   i. Educate People how to use power.
   ii. Proper design
   iii. Avoid chene source of energy.
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) .....
   b) Education purpose.
   c) Creation of Employment.
   d) Promote the area nationaly.
   e) Promote Unity.

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) .....
   b) no Effect
   c) No Pollution.
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) Improve facilities around

b) Improve growth and development

c)

d)

4. What are your main concerns regarding the proposed hydropower project?

a) Growth of Health centre.

b) Creation of job opportunities.

c) Growth and development.

d) Promote improvement of facilities.

5. How do you suggest that these concerns be addressed?

a) Job opportunities.

b) Construction of Infrastructure.

c) Promote improvement of facilities.

d) Construction of school.

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Open the high rate of area/place.

b) Construction of Part Agricon.

c) Construction of Sugarcane industry.

d) Construction of Industry (PAMPAPERS)

Negative changes

a) Mining of stone.

b) Criminals around

c) Poor security.

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health

Improvement of facilities.

Education

Promote interest in education.
promotion of technology -

Security

proper improvement of security.

Culture

Promote the local culture internationally -

Scenic beauty

Help like Tourism and Education site.

Employment

Creation of job among others -

Others (Specify)

Growth and development -

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health

None.

Education

Can promote the drop out of some students for cheap labour.

Security

None

Culture

None.

Scenic beauty

None.

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Vacation center around.

b) Construction of drinking water.

c) Construction of school.

Do you support the project? Yes.

THANKYOU

Ward MIHUU	**Constituency** KIBUKE EAST
Location CHETAMBE	**Sub-location** MIHUU -
Date of Interview 11/03/2021	
Start time	**End Time**

Questionnaire Number

002

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name JANE AKINYI
2. Respondent's name HERMAN NAMITI
3. Respondent's Address 218 WEBUYE
4. Respondent's telephone number 0726652606
5. Respondent's Email Address hermannamiti@gmail.com
6. Respondent's Signature

DEMOGRAPHIC DATA

1. Head of Household's Name HERMAN NAMITI
2. Sex: Male (✓) Female( )
3. Tribe LUYA.
4. Occupation FARMER.
5. Religion CHRISTIANITY
6. Total Household members 10
7. Education level of head of household (**Tick appropriately**)
   a) Primary ( )
   b) Secondary ( )
   c) College/ University (✓)
8. Total household members
9. What is your main source of income? FARMER

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 14YRS
2. What is the size of your land? 1 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase (✓)
   b) Inheritance ( )
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent (✓)
   b) Semi-permanent ( )
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 2KM
b) Health Centre 2KM
c) Public hospital 10KM
d) Private hospital 10KM
e) Social hall 10KM
f) Playing field 7KM.

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	Subsistence/sale	1	15 bags	1800/=
c)	Millet				
d)	Cassava				
e)	Beans ✓	Sale	1	2bags	200 per 2Ksh.
f)	Groundnuts	Subsistence	50 by 100	3 Per month	200 per piece.
g)	Bananas ✓				
h)	Vegetables				
i)	Potatoes ✓	Sale/Subsistence	1	50 bags	200 Kg.
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify)				
o)	Others (Specify)				
p)	TREES	Sale	300 PIECES	1 per month	9000/=

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow ✓	1	milking	201 = [200H
b)	Bull			
c)	Sheep			
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry ✓	10	Production of eggs 500 per each.	
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually	
a)	Malaria ✓				occasionaly
b)	Bilharzia				
c)	Typhoid				
d)	Cholera				
e)	Eye Infection				
f)	Anemia				
g)	Skin Disease				
h)	HIV/AIDs				
i)	Ulcers				
j)	Measles				
k)	Pneumonia				
l)	COVID-19				
m)	Others(Specify)				occasionally
n)	Coughing				
o)					
p)					
q)					

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital (✓)
b) Dispensary ( )
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 10 KM.
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?

High rate amount of cost availability.

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity	✓	✓	✓	✓		1000/=
Kerosene						
Charcoal						
LPG Gas						
Biogas						
Firewood ✓	✓	✓	✓			2000/=
Wind						
Solar ✓		✓		✓		5000/=

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Difficulty on cost.
   b. Low rate of sun.
   c. lack of power / Faulty transformers.
   d. .....

5. What are the suggested solutions?
   i. Should be in abundance.
   ii. Enough sunshine required.
   iii. Replacement possibility.
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) Displacement of neighbours around.
   b) Restriction in grazing.
   c) Security is minimized at low rate.
   d) .....
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) .....
   b) No any effection across the water
   c) No pollution of water.
   d) Water will remain some without reduction

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) Improvement of facilities around.

b) I will improve the rate of water in the area.

c)

d)

4. What are your main concerns regarding the proposed hydropower project?

a) Availability of water.

b) Promote security.

c) Construction of Infrastructure.

d) Creation of employment to people.

5. How do you suggest that these concerns be addressed?

a) Employing members around

b) Construction of Infrastructure.

c) Been a tourism / hotel centre.

d)

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Open up of the place along.

b) Construction of Industrys

c) Construction of sugarcane Industry

d)

Negative changes

a) Criminal involved in the area.

b) Lack of network connection

c) poor security in the area.

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health Improvement of facilities

Education promotion of better technology.

Security Improvement of security

Culture Change of Culture / tourism Centre.

Scenic beauty Improve better beauty

Employment Improve job opportunities.

Others (Specify) Improve clean water in the community
Improve construction of infrastructure

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health None.

Education

None.

Security

None.

Culture

None

Scenic beauty

None.

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Improvement of Infrastructure along the community

b) Improvement of Health Center.

c) Availability of Constructing near school.

Do you support the project? Yes

THANKYOU

Ward MIHUU	**Constituency** WEBUYE EAST
Location CHEKAMBE	**Sub-location** MIHUU
Date of Interview 11/03/2021	
Start time	**End Time**

Questionnaire Number

003

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name JANE AKINYI
2. Respondent's name EMMANUEL SITUMA SIKANGA
3. Respondent's Address 370 BEBUTE
4. Respondent's telephone number 0724758144
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name EMMANUEL SITUMA SIKANGA
2. Sex: Male (✓) Female( )
3. Tribe LUYA
4. Occupation FARMER
5. Religion CHRISTIAN
6. Total Household members 12
7. Education level of head of household **(Tick appropriately)**
   a) Primary (✓)
   b) Secondary ( )
   c) College/ University ( )
8. Total household members .....
9. What is your main source of income? FARMER
   .....

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 50 years.
2. What is the size of your land? 8 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent ( )
   b) Semi-permanent (✓)
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify) .....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre ..... 3km .....
b) Health Centre ..... 400km .....
c) Public hospital ..... 5km .....
d) Private hospital ..... 10km .....
e) Social hall ..... 9km. .....
f) Playing field ..... 9km. .....

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane ✓	Sale	1	40 lorry Per	3200/=
b)	Maize ✓	Subsistence	4	60 bags	3500/=
c)	Millet ✓	Sale	1		200 per 2kg
d)	Cassava				
e)	Beans ✓	Sale	4	4 bags	150/=
f)	Groundnuts				
g)	Bananas ✓	Subsistence	0.5	4 stem	200/=
h)	Vegetables ✓	Subsistence	½	daily production	200/=
i)	Potatoes ✓	Sale	½	1 bag 3months	40/=
j)	Peas				
k)	Onions ✓	subsistence	½	½ Weekly	200 Per each
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify)				
o)	Others (Specify)				
p)	MANGOES	subsistence		4 stems	1@ 5/=

Hen – 40 — 600
Duck – 3 — 400

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow ✓	12	milking & farming	1L 60/= 2 Litres
b)	Bull			
c)	Sheep ✓	5	sharing	150 @ 50/=
d)	Goats ✓	6	milking	1L @ 200/=
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry ✓			
j)	Others (Specify)			
k)	Dog		Security Purpose	800/=

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓			✓
b)	Bilharzia			
c)	Typhoid ✓		✓	
d)	Cholera			
e)	Eye Infection ✓		✓	
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles ✓			✓
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital (✓)
b) Dispensary ( )
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 10 KM.
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?
Because of high availability cost required.

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene						
Charcoal ✓	✓					1250/=
LPG Gas ✓	✓					800/=
Biogas						
Firewood ✓	✓					1600/=
Wind						
Solar						

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Get them from the forest
   b. .....
   c. .....
   d. .....

5. What are the suggested solutions?
   i. Planting more trees.
   ii. .....
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) Creation of job opportunities.
   b) No Pollution for resistance
   c) Construction of Infrastructures
   d) Growth and development.
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) .....
   b) No chemicals
   c) No Pollution
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) .....

c) Improvement of facilities.

d) Improve the growth and development

4. What are your main concerns regarding the proposed hydropower project?

a) .....

b) To Promote Job opportunity

c) Creation of growth and development

d) Improvement of Health Centre.

5. How do you suggest that these concerns be addressed?

a) .....

b) By Constructing Infrastructure.

c) Promotion of tourism Centre.

d) Creation of Health

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Construction of Health Centre / Hotel.

b) Revived of Industry.

c) Sell of Power gas introduced.

d) Establishment of Insurance industry.

Negative changes

a) Mining Stone.

b) Poor Security

c) High rate of of criminals.

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health .....

Improvement of facilities to people.

Education .....

Having skilled job education

Security .....

Improvement of Security.

Culture .....

Improvement of Culture.

Scenic beauty .....

Change of beauty.

Employment .....

offer opportunity of Job.

Others (Specify) Construction of Infrustuce.

offer Business activities.

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health .....

None.

Education

None

Security

None

Culture

None

Scenic beauty

None

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Construction of Infrastructure through linking of bridge.

b) Up grading of Health cenice.

c) Upgrading of access road.
Improvement of clean water

Do you support the project? YES.

THANKYOU

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 12 yrs.
2. What is the size of your land? 1/2 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent ( )
   b) Semi-permanent (✓)
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 0.3KM.
b) Health Centre 0.3KM.
c) Public hospital 10Km
d) Private hospital 10 KM
e) Social hall 10 KM.
f) Playing field 10KM.

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	Subsistance	1/2	7bags	2500/=
c)	Millet				
d)	Cassava				
e)	Beans ✓	Subsistance	1/2	1bag	200/=
f)	Groundnuts ✓	Subsistence	20 by 20	1/2 bag	250/=
g)	Bananas ✓	Subsistence	20 by 20	2 bunches	500/=
h)	Vegetables ✓	Subsistence	20 by 20	2 sacks	100/=
i)	Potatoes ✓	Subsistence	50 by 100	3 bags	700 Per Sack.
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify) Mango	Subsistence	20 by 20		200/=
o)	Others (Specify)				
p)					

Ward MIHUU	**Constituency** KIEBUYE EAST
Location MUCH	**Sub-location** NANGENI
Date of Interview 11/03/2021	
Start time	**End Time**

Questionnaire Number

004

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name JANE
2. Respondent's name BENDORA KERUNGA.
3. Respondent's Address .....
4. Respondent's telephone number 0790226261
5. Respondent's Email Address .....
6. Respondent's Signature PATRICK

DEMOGRAPHIC DATA

1. Head of Household's Name PATRICK KERUNGA
2. Sex: Male (✓) Female( )
3. Tribe LUYHA
4. Occupation FARMER
5. Religion CHRISTIAN
6. Total Household members 8
7. Education level of head of household **(Tick appropriately)**
   a) Primary (✓)
   b) Secondary ( )
   c) College/ University ( )
8. Total household members .....
9. What is your main source of income? FARMER

Hen -3 — 500/=

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow ✓	1	Milking	2L@ 120/=
b)	Bull			
c)	Sheep			
d)	Goats ✓	1	Rearing	1 @ 4000/=
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry ✓			
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓		✓	
b)	Bilharzia			
c)	Typhoid			
d)	Cholera			
e)	Eye Infection ✓		✓	
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)	Roundworm			
o)				
p)				
q)				

occasional

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital (✓)
b) Dispensary ( )
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 8KM.
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?

High rate of cost.

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity	✓	✓	✓	✓		1200/=
Kerosene						
Charcoal ✓	✓					300/=
LPG Gas						
Biogas						
Firewood ✓	✓					
Wind						200/=
Solar						

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. low rate of firewood during many seasons
   b. low rate of trees -
   c. Lose connection of wire / low rate of required power.
   d. .....

5. What are the suggested solutions?
   i. Planting more trees.
   ii. Planting more trees of different types -
   iii. Well construction of wire lines
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) .....
   b) Grazing area is secured.
   c) low rate of planting trees along.
   d) Displacement of members.
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) .....
   b) No pollution in the water
   c) No expected animals in water.
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) Improvement of facilities.

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) Promote act of tourism centre.

b) Creation of Employment.

c) Growth and development.

d) .....

5. How do you suggest that these concerns be addressed?

a) .....

b) Construction of Infrastructure.

c) Growth and development

d) Creation of Health centers.

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) .....

b) Construction of Health centre.

c) Availability of Sugarcane Industry.

d) Construction of bread bakery.

Negative changes

a) .....

b) Poor security

c) High rate of criminals.

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health Equipment of the hospital. Improve facilities.

Education Creation of jobs opportunities.

Security Improvement and security.

Culture Availability of tourism Centre.

Scenic beauty Improve better scenic beauty.

Employment Creat Employement of Community around.

Others (Specify) Improve Construction of Infrastructure. eff, Creation of gowth and developm.

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health None

Education

None

Security

None

Culture

none

Scenic beauty

None

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Up grade of water supply.

b) Imerove growth and devlwemen of school.

c) Up grading of Health Center

Do you support the project? YES

THANKYOU

Ward MIHUU	**Constituency** WABUKE EAST
Location MUJI	**Sub-location** NA NG'ENI
Date of Interview [illegible]	
Start time	**End Time**

Questionnaire Number

005

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name JANE AKINYI
2. Respondent's name JOSEPH MULATI
3. Respondent's Address 370 NIEBUVE
4. Respondent's telephone number 0112287539
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name JOSEPH MULATI
2. Sex: Male (✓) Female( )
3. Tribe LUYHA.
4. Occupation FARMER.
5. Religion CHRISTIAN.
6. Total Household members 12
7. Education level of head of household (**Tick appropriately**)
   a) Primary (✓)
   b) Secondary ( )
   c) College/ University ( )
8. Total household members .....
9. What is your main source of income? FARMER

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 51
2. What is the size of your land? 1 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent (✓)
   b) Semi-permanent ( )
   c) Temporary ( )
   d) Others .....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre ..... 1km.
b) Health Centre 0.02m
c) Public hospital 10KM
d) Private hospital 10KM
e) Social hall 9KM
f) Playing field ..... 9 KM

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	Subsistence	1	12 bags	2500/=
c)	Millet				
d)	Cassava ✓	Subsistence	1 ½	2 bags	200/=
e)	Beans ✓	Subsistence	1	3 bags	200 per 2kg
f)	Groundnuts				
g)	Bananas ✓	Subsistence	½	10 bunches	300/=
h)	Vegetables ✓	Subsistence	50' by 100		200/=
i)	Potatoes ✓	Subsistence	½	5 bags	200
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify)				
o)	Others (Specify)				
p)	Paw Paw	Sale	5 stems	10	50/=
	Mango	Sale	10 stems	1 crate	2000/=

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow			
b)	Bull			
c)	Sheep ✓	2	Milking	5000/=
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry / Hen ✓	20	laying Eggs	500/=
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓		✓	
b)	Bilharzia			
c)	Typhoid			
d)	Cholera			
e)	Eye Infection ✓			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers ✓		✓	
j)	Measles ✓		✓	
k)	Pneumonia ✓			
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

Diarrhoea mostly

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 6.02KM.
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?

Due to high cost consumed

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity	✓	✓	✓	✓		500/=
Kerosene						
Charcoal ✓	✓					400/=
LPG Gas						
Biogas						
Firewood ✓	✓					500/=
Wind						
Solar ✓		✓				300/=

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health Growth and Proper development required.

Education Development of school around the area.

Security Improment of security.

Culture Creation of culture

Scenic beauty Improve the vide of tourism centre.

Employment - Creation of job to member.

Others (Specify) High Education.
Improvement of the life style.

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health None.

Education

None

Security

None

Culture

None

Scenic beauty

None

Others (Specify)

None

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Upgrade of Health Centre.

b) Construction of school & Motorable road

c) Improvement of Infrastructure e.g road.

Do you support the project? YES

THANKYOU

Ward MIHUU	**Constituency** WEBUYE EAST
Location CHETAMBE	**Sub-location** MIHUU
Date of Interview 11·03·2021	
Start time	**End Time**

Questionnaire Number

006

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name Melvis Nafula Wekesa
2. Respondent's name Norah Naliaka
3. Respondent's Address 1590 Webuye
4. Respondent's telephone number 0758551287
5. Respondent's Email Address norahnaliaka@gmail.com
6. Respondent's Signature

DEMOGRAPHIC DATA

1. Head of Household's Name RICHARDSON NGANG'A
2. Sex: Male (✓) Female( )
3. Tribe KIKUYU
4. Occupation BUSINESSMAN
5. Religion CHRISTIAN
6. Total Household members FIVE MEMBERS
7. Education level of head of household **(Tick appropriately)**
   a) Primary ( )
   b) Secondary ( )
   c) College/ University (✓)
8. Total household members
9. What is your main source of income?
   Business

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Lack of resource required.
   b. Low rate of sun at times
   c. Low rate of power.
   d. .....

5. What are the suggested solutions?
   i. Planting more trees.
   ii. Required more sunshine.
   iii. Each individual child install his metre box.
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) Displacement of some neighbours.
   b) Plant affected.
   c) .....
   d) .....
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) .....
   b) No Pollution of water.
   c) Water will remain on the same percentage.
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) Improvement of facilities.

c) Treatment of water available.

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) Act as a tourist centre.

b) Growth and development of the area.

c) Creation of employment.

d) .....

5. How do you suggest that these concerns be addressed?

a) .....

b) Construction of dispensary.

c) Construction of schools e.g Primary.

d) Open the Percentage area of Environment.

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Construction of bread bakery.

b) Construction of well/springs around

c) Growth and development of industry.

d) Construction of Sugarcane Industry

Negative changes

a) Poor Security around.

b) Criminals around

c) Poor Mining of quarry on rocks.

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 5 years
2. What is the size of your land? 0.5 acres (Acres)
3. How did you acquire your parcel of land?
   a) Purchase (✓)
   b) Inheritance ( )
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent (✓)
   b) Semi-permanent ( )
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals ( )
e) Others (Specify) Buy drinking water from nearest town

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 2 km
b) Health Centre 1.5 km
c) Public hospital 7 km
d) Private hospital 17 km
e) Social hall 7 km
f) Playing field 4 km

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	Subsistence	50x100	1/2 bag of maize	
c)	Millet				
d)	Cassava				
e)	Beans ✓	Subsistence	50x100	10kilos	
f)	Groundnuts ✓	Subsistence	50x100	6 kilos	
g)	Bananas ✓	Subsistence	50x100	2 plants	
h)	Vegetables ✓	Subsistence	50x100	10kgs	
i)	Potatoes ✓	Subsistence	50x100	1 bag	
j)	Peas				
k)	Onions ✓	Subsistence	50x100	10kg	
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify) ✓ guavas / avocados	Subsistence	50x100	50 kg	
o)	Others (Specify)				
p)	honey harvest.		50x100	20 litres	

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow			
b)	Bull			
c)	Sheep			
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry			
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria			
b)	Bilharzia			
c)	Typhoid			
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 1.5 KM
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?
No grid power in the area.

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene ✓		✓				
Charcoal ✓	✓					1000 per bag
LPG Gas ✓	✓					300
Biogas						
Firewood ✓	✓					
Wind						
Solar ✓		✓		✓		

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Lack of electricity
   b. .....
   c. .....
   d. .....

5. What are the suggested solutions?
   i. Poor roads.
   ii. .....
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) Improve security
   b) Create job employment.
   c) Improve roads
   d) .....
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) Clean drinking water.
   b) .....
   c) .....
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) .....

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) .....

b) .....

c) .....

d) .....

5. How do you suggest that these concerns be addressed?

a) .....

b) .....

c) .....

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Road construction

b) In the area people has constructed permanent houses.

c) .....

d) .....

Negative changes

a) deforestation because of settlements.

b) Flooding which destroys crops

c) .....

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
With proper technology people will have good health.

Education
Parents will have money to facilitate their children to go to school.
Children will get time for reading due to electricity

Security
With security lights they are safe.

Culture
The old negative culture will empress the new culture.
It will encourage intertribe cohesion.

Scenic beauty
The project will act as a tourist centre.

Employment
Create employment during construction.

Others (Specify)
Population increase

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health

Education

Security

Culture

Scenic beauty

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Provision of clean affordable water.

b) Construction of roads.

c) Equiping health and electricity.

Do you support the project? Yes

THANKYOU

Ward MIHUU	**Constituency** KIBUNE EAST
Location CHETAMBE	**Sub-location** MIHUU
Date of Interview 11.03.2021	
Start time	**End Time**

Questionnaire Number

007

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name Melvis N. Nafula
2. Respondent's name Gilbert situma Wanyonyi
3. Respondent's Address 370 Webuye
4. Respondent's telephone number 0715896120
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name Gilbert situma Wanyonyi
2. Sex: Male (✓) Female( )
3. Tribe Luhya
4. Occupation Peassant farmer
5. Religion Christian
6. Total Household members 6 members
7. Education level of head of household **(Tick appropriately)**
   a) Primary (✓)
   b) Secondary ( )
   c) College/ University ( )
8. Total household members .....
9. What is your main source of income? farming

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 30 years
2. What is the size of your land? 1.8 acres (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent (✓)
   b) Semi-permanent ( )
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes (✓)
   b) No ( )

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 150 metres
b) Health Centre 800 metres
c) Public hospital 6 km
d) Private hospital 16 km
e) Social hall 6.5 km
f) Playing field 3 km

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	both	1.6 acres	18 bags	3000 per bag
c)	Millet ✓	both	50 X 100 mts	3 bags	200
d)	Cassava				
e)	Beans ✓	both	1.6 acres	2 bags	200
f)	Groundnuts				
g)	Bananas ✓	both	1 acre		500
h)	Vegetables ✓	both	50 X 100	10 kilogram	
i)	Potatoes ✓	both			
j)	Peas				
k)	Onions				
l)	Wheat ✓	both	50 X 100	1½ bags	
m)	Sorghum ✓	both	1 acres	1 bags	
n)	Fruits (Specify) ✓	both	50 X 100		10/= per fruit
o)	Others (Specify)				
p)					

pawpaw
passion
guavas
bananas

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow ✓	4	Milking	2500 /=
b)	Bull			
c)	Sheep			
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
✓i)	Poultry [ducks [broker	8	for selling	700
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓		✓	
b)	Bilharzia			
c)	Typhoid			
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 200 metres
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?
Far away from electricity due to poor roads.

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene						
Charcoal ✓	✓					
LPG Gas						
Biogas						
Firewood ✓	✓					
Wind						
Solar ✓		✓				36,000

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Smoke which affect their health
   b. .....
   c. .....
   d. .....

5. What are the suggested solutions?
   i. Connection of electricity
   ii. .....
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) Security lights.
   b) Restriction of water.
   c) Job opportunities
   d) Poverty eradication
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) Clean drinking water.
   b) .....
   c) .....
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) .....

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) .....

b) .....

c) .....

d) .....

5. How do you suggest that these concerns be addressed?

a) .....

b) .....

c) .....

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Building of permanent houses.

b) Subtribe cohesion

c) Good construction roads.

d) .....

Negative changes

a) Deforestation because residents are burning coals.

b) Flooding which destroy crops

c) .....

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
Water will be treated

Education
children will go to school as their parents will have money to facilitate their children

Security
With security lights residents are safe.

Culture
It will encourage intertribe cohesion

Scenic beauty
The project will attract tourists

Employment
Locals will get jobs

Others (Specify)

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
Chemicals from the hydropower will affect their health or organs like lungs

Education

Security

Culture

Scenic beauty

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Provision of clean drinking water

b) Supply of electricity.

c) Construction of roads

Do you support the project? Yes

THANKYOU

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow ✓	1	Milking	
b)	Bull			
c)	Sheep			
d)	Goats ✓	2		
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry Ichicken	4		
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓		✓	
b)	Bilharzia			
c)	Typhoid ✓			✓
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)	Mental disturbance ✓			occasionally
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 300m
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?

No connection of electricity

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene						
Charcoal ✓	✓					
LPG Gas						
Biogas						
Firewood ✓	✓					
Wind						
Solar ✓		✓				

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Deforestation
   b. .....
   c. .....
   d. .....

5. What are the suggested solutions?
   i. Encourage aforestation
   ii. To provide alternate source of energy
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) Locals will be employed.
   b) Supply of electricity
   c) Supply of clean drinking water.
   d) .....
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) Provision of clearing water
   b) .....
   c) .....
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) .....

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) Employment to locals

b) Education to locals on hydropower

c) .....

d) .....

5. How do you suggest that these concerns be addressed?

a) .....

b) .....

c) .....

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) There is dispensary in the area.

b) Public school in the area.

c) .....

d) .....

Negative changes

a) .....

b) .....

c) .....

Ward MARAKA	**Constituency** WEBUYE EAST
Location MUJI	**Sub-location** NANG'ENI
Date of Interview 11.03.2021	
Start time	**End Time**

Questionnaire Number

008

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name Medus Nasola Wekesa
2. Respondent's name Grace Nanwenga
3. Respondent's Address 310 Webuye
4. Respondent's telephone number 0706723912
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name Patrick Wekesa Werunga
2. Sex: Male (✓) Female( )
3. Tribe Luhya
4. Occupation Security guard
5. Religion Christian
6. Total Household members .....
7. Education level of head of household **(Tick appropriately)**
   a) Primary (✓)
   b) Secondary ( )
   c) College/ University ( )
8. Total household members 3 members
9. What is your main source of income? Security guard

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 68 years
2. What is the size of your land? 1 acre (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent ( )
   b) Semi-permanent (✓)
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals ( )
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 300 m
b) Health Centre 300 m
c) Public hospital 7 km
d) Private hospital 15 km
e) Social hall 4km
f) Playing field 4km

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	both	1acre	16bags of maize	3000 per bag
c)	Millet				
d)	Cassava				
e)	Beans ✓	both			
f)	Groundnuts				
g)	Bananas ✓	both			
h)	Vegetables				
i)	Potatoes				
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum ✓	both			
n)	Fruits (Specify)				
o)	Others (Specify)				
p)					

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
If no pollution there is no problem

Education
Education will improve.

Security
It will improve.

Culture

Scenic beauty
The hydropower will make the area beautiful

Employment
The hydropower will offer employment to youths

Others (Specify)

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health

Education

Security

Culture

Scenic beauty

Others (Specify)

- List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Building of polytechnic in the area.

b) Provision of clean drinking water

c) Building of secondary school within the area.

Do you support the project? Yes.

THANKYOU

Ward MARAKA	**Constituency** WEBUYE EAST
Location MUJI	**Sub-location** NAMG'ENI
Date of Interview 11.03.2021	
Start time	**End Time**

Questionnaire Number

D09

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name Melvis Nafula Wekesa
2. Respondent's name JOB WANJALA
3. Respondent's Address .....
4. Respondent's telephone number 0717382044
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name JOB WANJALA
2. Sex: Male (✓) Female( )
3. Tribe BUKUSU
4. Occupation SECURITY GUARD
5. Religion CHRISTIAN
6. Total Household members 5 members
7. Education level of head of household **(Tick appropriately)**
   a) Primary ( )
   b) Secondary (✓)
   c) College/ University ( )
8. Total household members .....
9. What is your main source of income? .....
   Agriculture.

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? over 30 years
2. What is the size of your land? 0.25 acres (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent ( )
   b) Semi-permanent (✓)
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes (✓)
   b) No ( )

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 300 metres
b) Health Centre 300 metres
c) Public hospital 7 KM
d) Private hospital 15 KM
e) Social hall 4 KM
f) Playing field 4 KM

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	subsistence	1/8 acre	3 bags	3000 per bag
c)	Millet				
d)	Cassava				
e)	Beans				
f)	Groundnuts				
g)	Bananas				
h)	Vegetables ✓	subsistence	1/8 acre		
i)	Potatoes ✓	subsistence	1/8 acre		
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify)				
o)	Others (Specify)				
p)					

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow ✓	1	Milking	300 per day
b)	Bull			
c)	Sheep			
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry			
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓		✓	
b)	Bilharzia			
c)	Typhoid ✓			occasionally
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 300M
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?

The area is not connected with the electricity.

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene						
Charcoal ✓	✓					
LPG Gas						
Biogas						
Firewood ✓	✓					
Wind						
Solar ✓		✓		✓		

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. No trees for burning coals due to deforestation
   b. .....
   c. .....
   d. .....

5. What are the suggested solutions?
   i. The government to lower the price of gas.
   ii. .....
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) It will help the community to develop
   b) Source of income
   c) .....
   d) .....
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) Clean water supply
   b) .....
   c) .....
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) .....

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) Hydropower project may lead to displacement of locals.

b) Expansion of roads which may take some of their land

c) The project for not considering locals for employment

d) .....

5. How do you suggest that these concerns be addressed?

a) Locals who will be affected will be affected

b) Compensation of their properties during construction

c) Locals to be employed

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) .....

b) .....

c) .....

d) .....

Negative changes

a) Empty promises from politicians

b) Ruined reputations which affects the community

c) Unskilled locals.

d) Poverty

e)

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
There is no lab in the nearest dispensary due to lack of electricity and equipments

Education
Student will get time for learning people by electricity.

Security
Provision of security lights
Installation of CCTVs

Culture

Scenic beauty
Improve beautiful environment.

Employment
Get job opportunities

Others (Specify)

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health

Education

Security
Naked electricity cables can cause danger

Culture

Scenic beauty

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Provision of clean drinking water.

b) Electrify the hospital, equip professions in the hospital

c) Scholarship for those who need higher education

Do you support the project? Yes

THANKYOU

Ward MIHUU	**Constituency** WEBUYE EAST
Location CHETAMBE	**Sub-location** MIHUU
Date of Interview 11·03 2021	
Start time	**End Time**

Questionnaire Number

010

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name MELVIS NAFULA WEKESA.
2. Respondent's name SHARON MUFUPI
3. Respondent's Address .....
4. Respondent's telephone number 0189142751
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name VICTOR MUFUPI
2. Sex: Male (✓) Female( )
3. Tribe Luhya
4. Occupation small business
5. Religion Christian
6. Total Household members 3 members
7. Education level of head of household **(Tick appropriately)**
   a) Primary (✓)
   b) Secondary ( )
   c) College/ University ( )
8. Total household members .....
9. What is your main source of income? .....
   small business

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 38 years
2. What is the size of your land? 2 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent (✓)
   b) Semi-permanent ( )
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 1.5 km
b) Health Centre 1 km
c) Public hospital 6.5 km
d) Private hospital 16 5 km
e) Social hall 6 5 km
f) Playing field 3.5 km.

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	sale		10 bags	
c)	Millet ✓	sale		10kg	
d)	Cassava				
e)	Beans ✓	sale		20 kilos	
f)	Groundnuts ✓	sale		30 kilos	
g)	Bananas				
h)	Vegetables ✓	both		10 kilograms	
i)	Potatoes ✓	both			
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify) guava	both			
o)	Others (Specify)				
p)					

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow			
b)	Bull			
c)	Sheep ✓	2		
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry 1 chicker	1		
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓			occasional
b)	Bilharzia			
c)	Typhoid ✓			occasional
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease ✓		✓	
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia ✓		✓	
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 1 KM
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?
No grid power in the area

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene ✓		✓				
Charcoal ✓	✓					
LPG Gas						
Biogas						
Firewood	✓					
Wind						
Solar ✓		✓				

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Smoke from kerosene, charcoal and kerosene
   b. .....
   c. .....
   d. .....

5. What are the suggested solutions?
   i. Connection of electricity
   ii. .....
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) Restriction of drinking water of animals and human beings.
   b) Job opportunities
   c) Security lights
   d) Improve roads
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) .....
   b) .....
   c) .....
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) .....

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) Hydropower will affect their health during lightening

b) .....

c) .....

d) .....

5. How do you suggest that these concerns be addressed?

a) .....

b) .....

c) .....

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Road construction

b) People has constructed parmanent houses.

c) construction of dispensary

d) .....

Negative changes

a) .....

b) .....

c) .....

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health.....

.....

.....

Education.....

children will be able to learn

.....

Security.....

.....

They will be safe

.....

Culture.....

.....

.....

.....

Scenic beauty.....

It will change the natural

.....

Employment.....

create job opportunities to both youth, men and women

.....

Others (Specify).....

.....

To improve the roads.

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health.....

.....

.....

Education

Security

Culture

Scenic beauty

The natural environment will change

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Provision of clean drinking water.

b) Improve road construction.

c) Security lighting

Do you support the project? Yes.

THANKYOU

Ward Muruku	**Constituency** Westlands East
Location Chiromo	**Sub-location** Muruku
Date of Interview 11.03.2021	
Start time	**End Time**

Questionnaire Number

011

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name Mewis Nafula Wekesa
2. Respondent's name Emmanuel Wafula
3. Respondent's Address .....
4. Respondent's telephone number 0728 363471
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name Emmanuel Wafula
2. Sex: Male (✓) Female( )
3. Tribe Luhya
4. Occupation farmer
5. Religion Christian
6. Total Household members 4
7. Education level of head of household **(Tick appropriately)**
   a) Primary ( )
   b) Secondary (✓)
   c) College/ University ( )
8. Total household members .....
9. What is your main source of income? farming

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 46 Years
2. What is the size of your land? 24 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent (✓)
   b) Semi-permanent ( )
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify) .....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 1.5 km
b) Health Centre 1 km
c) Public hospital 6.5 km
d) Private hospital 16.5 km
e) Social hall 6.5 km
f) Playing field 3.5 km

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	Sale		15 bags	
c)	Millet ✓	"		14 bags	
d)	Cassava				
e)	Beans ✓	"		40kg	
f)	Groundnuts ✓	"		40kg	
g)	Bananas				
h)	Vegetables ✓	both		10kg	
i)	Potatoes ✓	"			
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify) guava	"			
o)	Others (Specify)				
p)					

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow			
b)	Bull			
c)	Sheep ✓	2	manure	
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry	6	Eggs	
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓			
b)	Bilharzia			
c)	Typhoid ✓			
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia ✓		✓	
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

- occational
- occational

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 1 km
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?
No power in the area

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene ✓		✓				
Charcoal ✓	✓					
LPG Gas						
Biogas						
Firewood	✓					
Wind						
Solar		✓				

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?

a. Smoke

b. Cost of kerosene is high

c. .....

d. .....

5. What are the suggested solutions?

i. Connection to grid Power

ii. .....

iii. .....

iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?

a) Change of culture

b) .....

c) .....

d) .....

e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?

a) .....

b) .....

c) .....

d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) .....

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) Pollution during construction

b) .....

c) .....

d) .....

5. How do you suggest that these concerns be addressed?

a) .....

b) .....

c) .....

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Construction of roads

b) " " Fencing

c) " " home steads

d) .....

Negative changes

a) Deforestation

b) .....

c) .....

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health .....

.....

.....

Education Raise education standards

.....

.....

Security Improve

.....

.....

.....

Culture .....

.....

.....

.....

Scenic beauty Will create tourist sites

.....

.....

Employment Create employment to locals

.....

.....

Others (Specify) .....

.....

.....

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health .....

.....

.....

Education

Security

Culture

Scenic beauty The natural environment will improve

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Improvement of security roads

b) Raising standards of water road

c) Provide clean drinking water.

Do you support the project? Yes

THANKYOU

Ward Mihuu	**Constituency** Webuye East
Location Chwele	**Sub-location** Mihuu
Date of Interview 11/03/2021	
Start time	**End Time**

Questionnaire Number

012

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name Mervis N. Nafula
2. Respondent's name Joseph Mutavi
3. Respondent's Address 370 Webuye
4. Respondent's telephone number 0112287539
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name
2. Sex: Male (✓) Female( )
3. Tribe Luhya
4. Occupation Farmer
5. Religion Christian
6. Total Household members 8
7. Education level of head of household **(Tick appropriately)**
   a) Primary (✓)
   b) Secondary ( )
   c) College/ University ( )
8. Total household members .....
9. What is your main source of income? .....
   Farming

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 57 years
2. What is the size of your land? 2.5 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent (✓)
   b) Semi-permanent ( )
   c) Temporary ( )
   d) Others .....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes (✓)
   b) No ( )

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 350 m
b) Health Centre 250 m
c) Public hospital 6 km
d) Private hospital 16 km
e) Social hall 6.5
f) Playing field 3 km

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	both	1.8 acres	20	
c)	Millet ✓	"	50x100	3	
d)	Cassava				
e)	Beans ✓	"	1 acre	2	
f)	Groundnuts				
g)	Bananas ✓	"	25 plants		
h)	Vegetables ✓	"	50x50	15	
i)	Potatoes ✓	"			
j)	Peas				
k)	Onions				
l)	Wheat ✓	"	50x100	2	
m)	Sorghum ✓	"	0.5	1	
n)	Fruits (Specify) ✓	"	50x100		
o)	Others (Specify)				
p)					

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow	4	milking	2500
b)	Bull			
c)	Sheep			
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry	8	Eggs/selling	700
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓		✓	
b)	Bilharzia			
c)	Typhoid			
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence?.....
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?
Far distance from grid
.....

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene						
Charcoal ✓	✓					
LPG Gas						
Biogas						
Firewood ✓	✓					
Wind						
Solar ✓	✓					

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Smoke
   b. .....
   c. .....
   d. .....

5. What are the suggested solutions?
   i. Connection to electricity
   ii. .....
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) No
   b) .....
   c) .....
   d) .....
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) None
   b) .....
   c) .....
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) .....

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) .....

b) .....

c) .....

d) .....

5. How do you suggest that these concerns be addressed?

a) .....

b) .....

c) .....

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Building of permanent houses

b) Tarmacking of roads

c) .....

d) .....

Negative changes

a) Deforestation

b) Flooding

c) .....

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health Improve

Education Education performance will improve

Security Will benefit from Security lights

Culture Interaction of different Communities

Scenic beauty Will attract tourists

Employment Income will get jobs

Others (Specify) .....

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health .....

Education

Security

Culture

Scenic beauty

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Provision of clean drinking water

b) Improve standard of roads

c)

Do you support the project? Yes

THANKYOU

Ward MIHU U	**Constituency** KIBUYE EAST
Location CHEMBE	**Sub-location** MIHUU
Date of Interview 11/03/2021	
Start time	**End Time**

Questionnaire Number

013

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name JANE AKINYI
2. Respondent's name Geofrey Shiundu
3. Respondent's Address 218 Webuye
4. Respondent's telephone number 0727439894
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name Geofrey Shiundu
2. Sex: Male (✓) Female( )
3. Tribe LUYA
4. Occupation FARMER
5. Religion Christianity
6. Total Household members 8
7. Education level of head of household **(Tick appropriately)**
   a) Primary (✓)
   b) Secondary ( )
   c) College/ University ( )
8. Total household members .....
9. What is your main source of income? Farming

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 60yrs
2. What is the size of your land? 4 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent ( )
   b) Semi-permanent (✓)
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify) .....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 2km
b) Health Centre 2km
c) Public hospital 10km
d) Private hospital 10km
e) Social hall 10km
f) Playing field 7km

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	Sub/Sale	1	15 bags	1800 Y
c)	Millet				
d)	Cassava				
e)	Beans ✓	Sale	½	2bags	200 per 2 kgs
f)	Groundnuts				
g)	Bananas ✓	Subsistence	50by100	3 per month	250 per piece
h)	Vegetables				
i)	Potatoes ✓	Sale/Subsistence	¼	50 bags	200 per/ bags
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify)				
o)	Others (Specify)				
p)	Miles	Sale	300pieces	1 per month	2000 Y

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow ✓	1	milking	20 per Litres
b)	Bull			
c)	Sheep			
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry ✓	10	production of eggs	500 per tray
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually	
a)	Malaria ✓				Occasionally
b)	Bilharzia				
c)	Typhoid				
d)	Cholera				
e)	Eye Infection				
f)	Anemia				
g)	Skin Disease				
h)	HIV/AIDs				
i)	Ulcers				
j)	Measles				
k)	Pneumonia				
l)	COVID-19				
m)	Others(Specify)				
n)	Coughing				Occasionally
o)					
p)					
q)					

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital (✓)
b) Dispensary ( )
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 10km

(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?

high rate

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity	✓	✓	✓	✓		1000/=
Kerosene						
Charcoal						
LPG Gas						
Biogas						
Firewood	✓	✓	✓			2000/=
Wind						
Solar		✓		✓		5000/=

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?

a. low rate of sun
b. Cost of electricity is a bit high
c. Unreliable power supply
d. .....

5. What are the suggested solutions?

i. Transformers maintance by kenya power
ii. reduction in power cost
iii. .....
iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?

a) neighbours displacement
b) Restriction in grazing
c) .....
d) .....
e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?

a) .....
b) no effect
c) .....
d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) improvement of facilities around

b) Will improve, the rate of water in the area

c)

d)

4. What are your main concerns regarding the proposed hydropower project?

a) Water availability

b) Security

c) Creation of employment

d)

5. How do you suggest that these concerns be addressed?

a) improve in frastructure

b) employ member around the area

c)

d)

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) industrial construction ie sugarcane industry

b)

c)

d)

Negative changes

a) lack of network connection

b) Poor security in the area

c) immorality has increased

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
improve health facility

Education
promotion of better technology

Security
improve security

Culture
change of culture

Scenic beauty

Employment
Create job opportunity

Others (Specify) Clean water availability
construction of better infrastructure

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
None

Education

None

Security

None

Culture

None

Scenic beauty

None

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Improvement of health centre

b) Construction of better infrastructure

c) Improvement of education centre

Do you support the project? Yes

THANKYOU

Ward Mikun	**Constituency** Webuye East
Location Mwah	**Sub-location** Nangeni
Date of Interview 11/03/2021	
Start time	**End Time**

Questionnaire Number
014

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name JANE AMANYI
2. Respondent's name Isaac Kisiangani
3. Respondent's Address .....
4. Respondent's telephone number 0702 841436
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name
2. Sex: Male (✓) Female( )
3. Tribe Luhya
4. Occupation farmer
5. Religion Christian
6. Total Household members 8
7. Education level of head of household (**Tick appropriately**)
   a) Primary ( )
   b) Secondary (✓)
   c) College/ University ( )
8. Total household members 8
9. What is your main source of income? Farmer

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 27
2. What is the size of your land? 1 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent ( )
   b) Semi-permanent (✓)
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre ..... 0.4 km
b) Health Centre ..... 0.4 km
c) Public hospital ..... 11 km
d) Private hospital ..... 12 km
e) Social hall ..... 1 km
f) Playing field ..... 10 km

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	Subsistence	3/4	8 bags	2500
c)	Millet				
d)	Cassava				
e)	Beans ✓	"	1/2	1 bag	200/1kg
f)	Groundnuts ✓	"	20X20	1/2 bag	250/1kg
g)	Bananas ✓	"	3 plants		
h)	Vegetables ✓	"	20x20		
i)	Potatoes ✓	"	50x100	3 bags	
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify) mango	"	5 plants		
o)	Others (Specify)				
p)					

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow ✓	1	Milking	60 E| L
b)	Bull			
c)	Sheep			
d)	Goats ✓	2	Selling	4000 each
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry ✓	8	Eggs	20
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria	✓	✓	
b)	Bilharzia			
c)	Typhoid			
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia	✓		✓
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

   a) Hospital ✓
   b) Dispensary ( )
   c) Clinic ( )
   d) Traditional herbs ( )
   e) Others ( )

6. How far away is the health facility located from your residence? 8 km
   (Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

   Yes ( )
   No (✓)

2. Is your house connected to grid power?

   Yes ( )
   No (✓)

   If not, why?

   cost of installation

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene						
Charcoal ✓	✓					300/-
LPG Gas						
Biogas						
Firewood ✓	✓					200/mzigo
Wind						
Solar						

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Reduction of trees
   b. High cost of kerosene
   c. .....
   d. .....

5. What are the suggested solutions?
   i. Planting of many trees
   ii. Installation of electricity
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) Grazing area will reduce
   b) Deforestation
   c) .....
   d) .....
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) Pollution during construction
   b) .....
   c) .....
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) Improvement the standard

b) .....

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) Pollution due to noise and dust

b) .....

c) .....

d) .....

5. How do you suggest that these concerns be addressed?

a) Proper precaution should be

b) taken

c) .....

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Construction of Health centres

b) Construction of Cyber Industries

c) " " bakeries

d) .....

Negative changes

a) Poor Security

b) .....

c) .....

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health Equiping of the hospital

Education Raise standard of education

Security Improve the security

Culture Create cohesion between different tribes

Scenic beauty Create attraction site

Employment Gain employment to the youth

Others (Specify) .....

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health None

Education

None

Security

None

Culture

None

Scenic beauty

None

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Upgrade health facilities

b) Equip the school

c)

Do you support the project? Yes

THANKYOU

Ward MARAKA	**Constituency** Webuye East
Location Muji	**Sub-location** Hang'eni
Date of Interview 11.03.2021	
Start time	**End Time**

Questionnaire Number

015

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name Melvis Nafula Wekesa
2. Respondent's name Acha muchende
3. Respondent's Address 370 webuye
4. Respondent's telephone number 0798652509
5. Respondent's Email Address .....
6. Respondent's Signature AC

DEMOGRAPHIC DATA

1. Head of Household's Name Acha muchende
2. Sex: Male ( ) Female(✓)
3. Tribe Lunya
4. Occupation Farmer
5. Religion Christian
6. Total Household members 4 members
7. Education level of head of household **(Tick appropriately)**
   a) Primary (✓)
   b) Secondary ( )
   c) College/ University ( )
8. Total household members 4 members
9. What is your main source of income? farming

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 37 Yrs
2. What is the size of your land? 1 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent ( )
   b) Semi-permanent (✓)
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling (✓)
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals ( )
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 300m
b) Health Centre 300m
c) Public hospital 7km
d) Private hospital 15km
e) Social hall 4km
f) Playing field 4km

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	both	½ acre	8bags	3000per bag
c)	Millet				
d)	Cassava				
e)	Beans ✓	both	¼	½ bag	
f)	Groundnuts				
g)	Bananas ✓	both	50 by 100		
h)	Vegetables				
i)	Potatoes				
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum ✓	both	50 by 100		
n)	Fruits (Specify)				
o)	Others (Specify)				
p)					

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow ✓	1	milking	
b)	Bull			
c)	Sheep			
d)	Goats ✓	3		
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry/ chicken	6		
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria			
b)	Bilharzia			
c)	Typhoid ✓			
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)	Mental disturbance			
o)				
p)				
q)				

Occasionally

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 300m
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?

No connection in the area

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene						
Charcoal	✓					
LPG Gas						
Biogas						
Firewood	✓					
Wind						
Solar		✓				

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Deforestation
   b. .....
   c. .....
   d. .....

5. What are the suggested solutions?
   i. Provide alternative source of energy especially
   ii. for cooking
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) employment
   b) Supply of electricity
   c) .....
   d) .....
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) .....
   b) None
   c) .....
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) Improvement of health facilities

b) .....

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) Employment to locals

b) .....

c) .....

d) .....

5. How do you suggest that these concerns be addressed?

a) .....

b) Education to locals on hydro power

c) .....

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) building of a dispensary

b) building of a public school in the area

c) .....

d) .....

Negative changes

a) .....

b) .....

c) .....

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
None

Education
improvement of education facilities

Security
improvement in security

Culture
None

Scenic beauty
None

Employment
The construction of hydropower will offer employment to the youth of the area

Others (Specify)

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
Polution of the air

Education

Security

Culture

Scenic beauty

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Building a higher education centre in the area

b) Improve infrastructure

c) Provision of clean water for drinking

Do you support the project? Yes

THANKYOU

Ward MIHUU	**Constituency** WEBUYE EAST
Location CHEMBE	**Sub-location** MIHUU
Date of Interview 11.03.2021	
Start time	**End Time**

Questionnaire Number

016

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name Mewis Nafula Wekesa
2. Respondent's name Timothy Khalama
3. Respondent's Address 1590 Webuye
4. Respondent's telephone number 0746379024
5. Respondent's Email Address .....
6. Respondent's Signature T.K.

DEMOGRAPHIC DATA

1. Head of Household's Name Timothy Khalama
2. Sex: Male (✓) Female( )
3. Tribe Luhya
4. Occupation Businessman
5. Religion Christianity
6. Total Household members 5
7. Education level of head of household **(Tick appropriately)**
   a) Primary ( )
   b) Secondary (✓)
   c) College/ University ( )
8. Total household members 5
9. What is your main source of income? Business

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 30yrs
2. What is the size of your land? 1 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent (✓)
   b) Semi-permanent ( )
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling (✓)
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals ( )
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 2km
b) Health Centre 1.5km
c) Public hospital 7km
d) Private hospital 17km
e) Social hall 7km
f) Playing field 4km

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	Subsistence	½	1 bag	2800 per bag
c)	Millet				
d)	Cassava				
e)	Beans ✓	both	50 by 100	10kilos	
f)	Groundnuts ✓	subsistence	50by100	6 kilos	
g)	Bananas ✓	subsistence	50by100	2 per month	
h)	Vegetables ✓	subsistence	50by100	1 bag	
i)	Potatoes				
j)	Peas				
k)	Onions ✓	subsistence	50 by 100	10kg	
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify)				
o)	Others (Specify)				
p)	honey harvest		50 x100	20 Litres	

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow	1	milking	
b)	Bull			
c)	Sheep			
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry			
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓			occasionally
b)	Bilharzia			
c)	Typhoid			
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 1.5Km

(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No (✓)

If not, why?

No connection in the area.

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene ✓		✓				
Charcoal ✓	✓					1000 per bag
LPG Gas ✓	✓					3000/=
Biogas						
Firewood ✓	✓					
Wind						
Solar ✓		✓				

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?

a. Inadequate Sunlight

b. .....

c. .....

d. .....

5. What are the suggested solutions?

i. .....

ii. .....

iii. .....

iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?

a) Improvement of infrastructure

b) employment of the youth in the area

c) Improvement of security

d) .....

e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?

a) Clean drinking water

b) .....

c) .....

d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) Improvement of health facilities

b)

c)

d)

4. What are your main concerns regarding the proposed hydropower project?

a) displacement of neighbours

b)

c)

d)

5. How do you suggest that these concerns be addressed?

a) Minimise the area in which the hydropowe

b) is to be constructed

c)

d)

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Road construction

b) Construction of permanent houses

c)

d)

Negative changes

a) deforestation in search of energy

b) flooding which destroys crops

c)

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
Health facilities will improve

Education
facilitation of better education

Security
Security lights will improve security

Culture

Scenic beauty
the project will attracts as a tourist centre

Employment
employment during construction

Others (Specify)

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health

Education

Security

Culture

Scenic beauty

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Road Construction

b) Equiping better health facilities

c) provision of clean and affordable water supply

Do you support the project? yes

THANKYOU

Ward Mihuu	**Constituency** Webuye East
Location Chetambe	**Sub-location** Mihuu
Date of Interview 11/02/2021	
Start time	**End Time**

Questionnaire Number

007

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name JANE ANYAYI
2. Respondent's name Fred Wafula
3. Respondent's Address .....
4. Respondent's telephone number 0727784231
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name Fred Wafula
2. Sex: Male ( ) Female( )
3. Tribe Luhya
4. Occupation Businessman
5. Religion Christian
6. Total Household members 10
7. Education level of head of household **(Tick appropriately)**
   a) Primary ( )
   b) Secondary (✓)
   c) College/ University ( )
8. Total household members 10
9. What is your main source of income? Business

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 54
2. What is the size of your land? 6 (Acres)
3. How did you acquire your parcel of land?
   a) Purchase ( )
   b) Inheritance (✓)
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent ( )
   b) Semi-permanent (✓)
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River (✓)
   b) Well ( )
   c) Dam ( )
   d) Tap ( )
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre ..... 3 kms .....
b) Health Centre ..... 4 kms .....
c) Public hospital ..... 5 kms .....
d) Private hospital ..... 9 kms .....
e) Social hall ..... 8 kms .....
f) Playing field ..... 9 kms .....

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane ✓	Sale	1	40 tonne	3200/=
b)	Maize ✓	Both	4	60 bags	3500/=
c)	Millet ✓	"	1		210/2kg
d)	Cassava				
e)	Beans ✓	"	4		150/=
f)	Groundnuts				
g)	Bananas ✓	"	1/2	6 plants	200 per bunch
h)	Vegetables ✓	"	1/2		
i)	Potatoes ✓	"	1/2	1 bag/2 months	40/= kg
j)	Peas				
k)	Onions ✓	"	1/2		20 per each
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify)				
o)	Others (Specify)				
p)	Mangoes	"		4 tems	@ 5/=

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow ✓	12	Milking/Farm	600 Per Liter
b)	Bull			
c)	Sheep ✓	5	Sale	5000 each
d)	Goats ✓	4	Milking	1k @ 2000
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry ✓			
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓			✓
b)	Bilharzia			
c)	Typhoid ✓		✓	
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles ✓			✓
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital (✓)
b) Dispensary ( )
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 11 km
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes ( )
No (✓)

2. Is your house connected to grid power?

Yes ( )
No ( )

If not, why?
High cost

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity						
Kerosene						
Charcoal ✓	✓					1250 Per bag
LPG Gas ✓	✓					800 per 6kg
Biogas						
Firewood ✓	✓					1500 per month
Wind						
Solar						

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Shortage of trees
   b. .....
   c. .....
   d. .....

5. What are the suggested solutions?
   i. Planting trees
   ii. .....
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) Destruction of natural environment
   b) .....
   c) .....
   d) .....
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) Pollution Especially during
   b) construction
   c) .....
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) Improvement of heath facility

b) \

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) Whether it will employ the locals

b) .....

c) .....

d) .....

5. How do you suggest that these concerns be addressed?

a) There should be an agreement

b) .....

c) .....

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Construction of heath centre

b) Reopen of paper mill

c) Establishment of sycamore industry

d) .....

Negative changes

a) Mining stone

b) Poor security

c) .....

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health Improvement of of facility

Education Introduction of skilled education

Security Improvement of security

Culture Cohesion with different communities

Scenic beauty Improvement of scenic beauty

Employment Other job opportunities to locals

Others (Specify) - Construction of infrastructure
- Offer business opportunities

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health

None

Education

None

Security

None

Culture

None

Scenic beauty

Others (Specify)

None

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Upgrading of health centre

b) Upgrading of access roads

c) Provision of clean water.

Do you support the project? Yes

THANKYOU

Ward Mihuu	**Constituency** Webuye East
Location Chitambe	**Sub-location** Mihuu
Date of Interview 11th 3rd 21	
Start time	**End Time**

Questionnaire Number

018

INTRODUCTION

Jiatian (K) Company Ltd propose to generate **20MW** Hydropower. This questionnaire is administered to collect views of the project community members regarding the proposed project in order to facilitate in the compilation of Environmental Impact Assessment report as required by EMCA (1999) and EIA rules and regulations (2003). Your response is confidential.

GENERAL INFORMATION

1. Enumerator's name Melvis Nafula Wekesa
2. Respondent's name Anita Sara M. Wekesa
3. Respondent's Address .....
4. Respondent's telephone number 0722452641
5. Respondent's Email Address .....
6. Respondent's Signature .....

DEMOGRAPHIC DATA

1. Head of Household's Name Anita Sara
2. Sex: Male ( ) Female(✓)
3. Tribe Luhya
4. Occupation businesswoman
5. Religion Christianity
6. Total Household members 4
7. Education level of head of household (**Tick appropriately**)
   a) Primary ( )
   b) Secondary (✓)
   c) College/ University ( )
8. Total household members 4
9. What is your main source of income? business

MAIN QUESTIONNAIRE

LAND AND HOUSING

Land

1. For how long have you lived in this area? 16Yrs
2. What is the size of your land? 2 acres (Acres)
3. How did you acquire your parcel of land?
   a) Purchase (✓)
   b) Inheritance ( )
   c) Communal land ( )
   d) Allotment by government ( )

Housing

1. Housing Typology **(tick appropriately)**
   a) Permanent (✓)
   b) Semi-permanent ( )
   c) Temporary ( )
   d) Others.....

WATER

1. What is your source of water? Please tick appropriately
   a) River ( )
   b) Well ( )
   c) Dam ( )
   d) Tap (✓)
   e) Others specify ( )

2. Is your water treated?
   a) Yes ( )
   b) No (✓)

3. If not, how do you ensure the water is safe for drinking? (Tick appropriately)

a) Boiling ( )
b) Filtering ( )
c) Decanting ( )
d) Use of Chemicals (✓)
e) Others (Specify).....

SOCIAL AMENITIES

1. How far (in KMs) from your residence is the nearest

a) Shopping Centre 100 metres
b) Health Centre 100 metres
c) Public hospital 7 km
d) Private hospital 14 km
e) Social hall 2 km
f) Playing field 3 km

AGRICULTURAL PRODUCTION

A) Crop Production

#	Crop Type	Subsistence/Sale	Acreage	Production	Unit Price (Ksh)
a)	Sugarcane				
b)	Maize ✓	Sale	1	16 bags	2800 per bag
c)	Millet				
d)	Cassava				
e)	Beans				
f)	Groundnuts				
g)	Bananas				
h)	Vegetables				
i)	Potatoes				
j)	Peas				
k)	Onions				
l)	Wheat				
m)	Sorghum				
n)	Fruits (Specify)				
o)	Others (Specify)				
p)					

B) Livestock Production and Composition

#	Animal	Number	Purpose	Income (Ksh.)
a)	Cow			
b)	Bull			
c)	Sheep			
d)	Goats			
e)	Donkeys			
f)	Pigs			
g)	Camels			
h)	Rabbits			
i)	Poultry			
j)	Others (Specify)			
k)				

PUBLIC HEALTH

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

#	Disease	Monthly	Seasonally	Annually
a)	Malaria ✓			
b)	Bilharzia			
c)	Typhoid ✓			
d)	Cholera			
e)	Eye Infection			
f)	Anemia			
g)	Skin Disease			
h)	HIV/AIDs			
i)	Ulcers			
j)	Measles			
k)	Pneumonia			
l)	COVID-19			
m)	Others(Specify)			
n)				
o)				
p)				
q)				

5. Where do you seek medical assistance when sick? **Tick appropriately**

a) Hospital ( )
b) Dispensary (✓)
c) Clinic ( )
d) Traditional herbs ( )
e) Others ( )

6. How far away is the health facility located from your residence? 100 meters
(Distance in Kilometers)

ENERGY

1. Is the area served with grid power?

Yes (✓)

No ( )

2. Is your house connected to grid power?

Yes (✓)
No ( )

If not, why?

.....

.....

3. What is the type of energy used in your home/business? **(Tick appropriately)**

Type of energy	cooking	lighting	Heating	Phone charging	Other uses	Cost (Ksh)/month
Electricity		✓		✓		
Kerosene						
Charcoal	✓					
LPG Gas						
Biogas						
Firewood						
Wind						
Solar		✓				

Other (specify)						

4. What challenges do you get in accessing and using these sources of energy?
   a. Unreliable power supply
   b. .....
   c. .....
   d. .....

5. What are the suggested solutions?
   i. better and reliable power supply
   ii. .....
   iii. .....
   iv. .....

PERCEPTIONS ABOUT THE PROPOSED PROJECT

1. How do you think the proposed hydropower project will affect you?
   a) It will boast my business
   b) .....
   c) .....
   d) .....
   e) .....

2. What impact do you think the proposed hydropower project will have on your water sources?
   a) Supply of clean water for drinking
   b) .....
   c) .....
   d) .....

3. What impact do you think the proposed hydropower project will have on your health and health facilities?

a) .....

b) .....

c) .....

d) .....

4. What are your main concerns regarding the proposed hydropower project?

a) .....

b) .....

c) .....

d) .....

5. How do you suggest that these concerns be addressed?

a) .....

b) .....

c) .....

d) .....

6. List the changes that have taken place in the project area over the last 30yrs

Positive changes

a) Construction of bett. roads

b) .....

c) .....

d) .....

Negative changes

a) Deforestation in the area

b) .....

c) .....

d) .....

e) .....

GENERAL PROJECT IMPACTS

1. What are the **Positive Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health
Health facilities enhancement

Education

Security
Security lights will improve security.

Culture

Scenic beauty

Employment
Creation of job opportunity

Others (Specify)

What **Negative Impacts** do you anticipate from the proposed hydropower project in this area in terms of?

Health

Education

Security

Culture

Scenic beauty

Others (Specify)

List in priority possible Corporate Social Responsibilities (CSR) that the proposed hydropower project can do?

a) 1. Clean water for drinking

b) improvement of infrastructure

c)

Do you support the project? Yes

THANKYOU