ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED SUKARI INDUSTRIES LIMITED SUGAR FACTORY ON PLOT No. TRANSMARA / MOYOI / 1908 IN MOYOI LOCATION, TRANSMARA SOUTH NAROK COUNTY

PROPONENT

SUKARI INDUSTRIES LTD

P.O. Box 432 – 40302 Ndhiwa

CONSULTANTS/ EXPERT:

Assesscons Company Limited
EIA / EA Firm Registration No. 11480
P.O. Box 1227 Suna

This Environmental Impact Assessment (EIA) Study Report is undertaken, prepared and report submitted to National Environment Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, Cap 387, Environmental (impact Assessment and Audit) regulation 2003 and Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019

@ August, 2022

REPORT CERTIFICATION

CONSULTANT
Assescons Company Limited
Pursuant to the Environmental Management and Coordination Act (EMCA) No.8 of 1999, Section 58 (1) the Second Schedule and EIA Regulations, 2003 (Regulations 31, 34 and 35), I hereby submit this Environmental Impact Assessment study report for the proposed Sukari Industries Limited sugar factory to be put up on plot No Transmara / Moyoi / 1908 in Moyoi Location, Transmara East - Narok County. This report has been prepared as per the requirements of Environmental Management and Coordination Act (EMCA) Cap 387, and EIA and EA Regulations of 2003. All information contained in this report is accurate and a truthful representation of all findings. **Name: Kibathi G. Jerald** **Lead Expert Reg No. 1817** **P.O. Box 1227-40400 Suna** **Date: …….** **Sign …….**

PROPONENT
Sukari Industries Limited
I confirm that this EIA study report for the proposed Sukari Industries Limited sugar factory to be put up on plot No Transmara / Moyoi / 1908 in Moyoi Location, Transmara East - Narok County has been undertaken and forwarded to NEMA with the Authority of the proponent; Ministry of Public Works, lands and Housing – Migori County. I confirm the commitment of the proponent to ensure implementation of recommendations of this EIA report **Name: ……..** **Designation: ……** **Signature: ……..** **Date: ……**

ACRONYMS

%	**:** Percentage
^{0}C	**:** Degrees Celsius
AIDS	**:** Acquired Immune Deficiency Syndrome
CBD	**:** Central Business District
CO	**:** Carbon Monoxide
COP	**:** Conference of Parties
dB (A)	**:** Decibels
EA	**:** Environmental Audit
EIA	**:** Environmental Impact Assessment
EMC	**:** Environmental Management Coordination
EMCA	**:** Environmental Management Coordination Act
EMP	**:** Environmental Management Plan
HFCs	**:** Hydro fluorocarbons
HIV	**:** Human Immunodeficiency Virus
Km	**:** Kilometres
Km^2	**:** Square Kilometers
KPLC	**:** Kenya Power and Lighting Company
KRA	**:** Kenya Revenue Authority
MDGs	**:** Millennium Development Goals
Mg/l	**:** Milligram per Litre
NEAP	**:** National Environment Action Plan
NEC	**:** National Environment Council
NEMA	**:** National Environment Management Authority
No	: Number
NO_2	: Nitrogen Dioxide
NOX	**:** Nitrogen Oxide
OHSO	**:** Occupational Health and Safety Office
Pb	**:** Lead
PCs	**:** Private Companies
PFCs	**:** Per fluorocarbons
PM	**:** Particulate Matter
PPE	**:** Personal Protective Equipment
PVC	**:** Polyvinyl Chloride
RPM	**:** Respiratory Particulate Matter
SHE	**:** Safety, Health and Environment
SO_2	**:** Sulphur Dioxide
SPM	**:** Suspended Particulate Matter
SWM	**:** Solid Waste Management
TOR	**:** Terms of Reference
UNCED :	**:** United Nations Conference on Environment and Development
UNFCCC	**:** United Nations Framework Convention on Climate Change
WHO	**:** World Health Organization
WRA	**:** Water Resources Authority
WSB	**:** Water Services Board
WSP	**:** Water Services Provider
WSRB	**:** Water Services Regulatory Board

EXECUTIVE SUMMARY

E1. Introduction

Sukari Industries Limited wishes to establish a 3000 TCD sugar cane milling factory at Moyoi, Lolgorian, Transmara East Sub county Narok County. Sukari Industries Limited is a registered company incorporated under the Companies Act (Cap. 486). It currently runs a sugar milling plant at Ndhiwa Town of Homa Bay County. The company's operation includes processing sugar cane from out grower' fields as it have not yet established its own nucleus; to produce from the harvested sugar cane at its factory.

In order to ensure that the proposed Project is implemented in an environmentally and socially sustainable manner, the consultant has conducted an Environmental and Social Impact Assessment (ESIA) for the proposed project. This is in accordance with Environmental Management and Co-ordination Act (EMCA), 1999, and Environmental Impact Assessment (EIA) Regulations of 2003 and other Kenyan statutory requirements and other international conventions.

E2. ESIA Methodology

Data used for compiling this report was obtained through several data collection methods including; observation and transects walks in the project area, interview with key informants, administering of questionnaires, public participation and consultations, use of checklists, physical investigation and analysis of parameters, literature review of the previous consultant report and those from the client. Photography and documentation of notes were also utilized in the study. Public meetings were held in all the sub-locations within the project area where various issues revolving around the proposed project where discussed. *Copies of the minutes are attached in the annex*

E3: Project Location

The project is to be located on plot No Transmara / Moyoi / 1908 located Lolgorian Division, Moyoi Location, Moyoi Ward, Transmara South Sub County (hived from formerly Transmara West Sub County) - Narok County. The site is off Kehancha – Lolgoria / Maasai Mara road at the point River Mugor crosses Kehancha – Lolgoria road. The site is on Latitude 1°12'34.55"S and longitude 34°42'22.88"E.

E4. Project Description

The proposed project has already procured a 20.195 hectare parcel of land to construct the envisaged 3,000-tcd factory and at the same time the staff quarter for technical and managerial staffs. Additional land parcels will be acquired at appropriate time for further expansion. The factory will be constructed using locally available materials including blocks, cement, ballast and timber, all

obtained from nearby suppliers or from Migori or Narok Counties. The buildings to be constructed will mainly consist of the factory structures and the following: Workshops, administrative offices, weighbridge house, cane yard, mill House, power house, sugar house/warehouse, agriculture offices, staff Houses, and stores. The factory will be surrounded by a 7 feet high perimeter wall.

The factory buildings will be constructed in accordance with the machinery supplier's specifications and the architectural plans layout. All the constructions will be done under the guidance of the Project Engineer.

E5. Baseline characteristics of the project area

The proposed project is to be undertaken in Moyoi Location at the boundary of Mugor and Steti Rivers and Masurura Location. The communities in the project area are largely pastoralist and small scale farmers (maize, cassava, groundnuts, vegetables, potatoes etc), sugarcane as a cash crop and small scale business men and women in shopping Centres within the project area; Masurura, Loliondo and Lolgorian. The lands in this area are verse, sparsely populated and privately owned. The site borders two Rivers; Mugor and Steti. The project area is characterized by a semi-arid climate with wide valleys and escarpments. It has diversified vegetation that includes grassland, Acacia woodland, riverine vegetation's forest, crop farms / plantations, non-deciduous thickets, Acacia, Tarchonanthus and Croton Scrub.

E6. Review of legislative frameworks, policies and institutional arrangements

The ESIA examined; legal frameworks, policy frameworks, national regulatory frameworks, international policy frameworks that are relevant to this project. The preparation of this ESIA has taken into account Chapter 5 of the Kenyan Constitution, the requirements for Environmental Assessment and mainly Section 58 of the Environmental Management and Co-ordination Act, 1999 of Kenya which provides for the establishment appropriate legal and institutional framework for the management and protection of the environment.

E7. Public participation and stakeholders' engagement

Public consultation, participation and stakeholders engagement for the proposed Project was conducted in the month of July 2022 between the dates of 4th to 21st. this was done through:

i. Office consultation;
ii. Public Meetings chaired by the local administrations;
iii. Stakeholders engagement meetings;

Issues that arose during the public consultations include: Food security, corporate social responsibilities, job opportunities, pollution of the neighbouring rivers, infrastructure

development, capacity building (giving farm inputs, advances, trainings and sensitization) to the community to farm sugarcane, late / delayed cane harvesting and payments, benefits the community will get from the project and economic and social development. These issues were satisfactorily responded to and adequately handled in the report. It was therefore noted that the local community and stakeholders indicated their desire to have the factory and they hoped for its quick implementation to improve people's livelihood.

E8. Identification of Impacts and Mitigation Measures

Implementation of this Sugar project has both positive and negative impacts to the social, cultural, economic, physical and biological environment. The positive impacts will be maximized through undertaking enhancing measures while mitigation measures will be undertaken to reduce the effects of negative impacts.

E9. Positive impacts

Positive Impacts during pre-construction and Construction

- Improved sugarcane production,
- Employment opportunities at the construction site
- Creation of a market for construction materials hence boost in businesses in the area
- Farmers will be educated and given awareness on sugarcane growing and farming
- Gains in the local and national economy through consumption of project materials that will attract taxes which will be payable to the government.
- Increased income among locals,
- Agro-industrial growth
- Timely cane harvesting and payments
- Increased access into the community because of maintained roads by the company to the market within the project area,
- Availability and access to financial services,
- Increased land value and demand, growth of local economy and
- Opportunities for skill acquisition by the local people.
- Optimal land use
- Improved amenities as a result of CSRs
- Reduced transport cost and time for famers and the company

E10. Negative impacts include

- Fear of food insecurity during operation phase
- Threat to indigenous vegetation due to clearing land for sugarcane farming
- Land degradation during acquisition of construction materials
- Generation of waste during all phase of the project hence pollution if not well managed
- Air pollution during all phase of the project due to dust and exhaust emissions
- Noise and vibration generation
- Occupational health and safety Risks
- Social conflicts such as gender role conflicts and land use conflict between farmers and pastoralist
- Water pollution (River Mugor and Steti) if liquid and solid wastes are not well managed
- Vegetation and fauna disturbance during construction phase
- Social issues such as family breakup, prostitution, child labor,
- Climate change due to air pollution and use of aerosol chemical (agrochemical sprays)
- Increased resource utilization: energy and water
- Increased storm water flow hence increased soil erosion and water (river) pollution and siltation
- Change in land use from agricultural to industrial
- Water and air pollution from poor management of bagasse
- Increased traffic that may cause accidents

E11. Mitigation Measures

Based on the site inspection, analysis, assessment and the views of the neighbouring community consulted, it is evident that the construction and operation of the proposed Sugar Factory will in overall be beneficial to the study area as it will boost the agro-economy of the area and lead to improved economic condition of the locals. The anticipated negative impacts of the proposed Project will be mitigated as per the best practice. The mitigations are addressed in the report and also in the environmental management plan for all project phases and they include;

- Protecting the terrestrial and riverine ecosystem from degradation,
- Treatment of effluent to the required standards,
- Proper management of solid waste

- Proper use and conservation of water to minimize wastage,
- Proper management of bagasse to reduce the heap, bad smell and to control leachate
- Proper management of oil waste and fuel spills;
- Air pollution control by use of gas scrubbers and electrostatic particulate trapper (precipitator) to trap and neutralize emissions and minimize air emissions;
- Adherence to occupational safety and health rules at the workplace to control risks and hazards and
- Undertaking corporate social responsibilities as recommended; and
- Working with local leadership to handle social impacts

E12. Environmental and Social Management (ESMPs)

To ensure that the negative environmental impacts can be controlled and mitigated effectively, a stringent and scientific management plan has been prepared. This project report has developed an EMP to provide the basis for an Environmental Management System for the proposed the sugar factory project hence the projected negative impacts will be prevented where possible, minimized and mitigated through implementation of the measures recorded in the ESMP. The proponent is committed to implement the recommended measures as outlined in this report.

The ESMP should be availed to prospective bidders in order to ensure that normal environmental mitigation costs are factored into construction costs. The Contractor is expected to prepare work plans for environmental management in line with the ESMP. The proponent or his appointed Engineer will be responsible for reviewing civil works contract in accordance with the ESMP report. Proponent will have an officer in charge of coordinating and monitoring of the implementation of ESMP in collaboration with NEMA; and, preparation of environmental progress reports.

In general assessment it was found that:-

- The project is not likely to directly or indirectly disrupt the existing settlement if the mitigation measures are adhered to;
- Environment will not be affected if the recommended mitigation measures are ensured.
- Project is viable and should be implemented on condition that the mitigation measures identified are implemented.

E13. Conclusion and recommendations

Based on the assessment, it is concluded that the proposed project is implementable. The identified and potential negative environmental, social, health and safety impacts that are anticipated from this project can easily be mitigated as outlined in this report while the positive ones maximized as much as possible. This will ensure that, the operations of this project are environmentally friendly.

It is therefore recommended that:

i. The proposed project be implemented in compliance with all the relevant legislation requirements in Kenya at all times;
ii. In addressing the environmental issues, the contractor and/or proponent must follow the mitigation guidelines provided under in this report;
iii. Proponent and the Contractor are required to undertake Environmental Monitoring to ensure that the Construction is done in compliance with the provisions of the EIA License;
iv. The proponent should undertake an environmental audit (EA) of the project, as required by EIA regulation.

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CHAPTER 1: INTRODUCTION

1.1. Project Background

The proponent, Sukari Industries Limited, wishes to establish a 3000 TCD sugar cane milling factory at Moyoi, Lolgorian, Transmara East Sub county Narok County. Sukari Industries Limited is a registered company incorporated under the Companies Act (Cap. 486). It currently runs a sugar milling plant at Ndhiwa Town of Homa Bay County. The company's operations include the production of sugar cane mainly from out grower' fields as it has not yet established its own nucleus; and processing sugar from harvested sugar cane at its factory.

1.2. Rationale for an Environmental Impact Assessment

Under Part VI Section 58 of the Environmental Management and Coordination Act 1999 No. 8, any person, being a proponent of a project is required to apply for and obtain an Environmental Impact Assessment (EIA) license from National Environment Management Authority (NEMA) before he/she can finance, commence, proceed with, carry out, execute, or conduct any undertaking specified in the 2nd Schedule of the Act.

The proponent wishes to establish a sugar mill at the project site which hitherto has been agricultural. He will encourage the community to invest in sugar cane farming and will assist them with farming requirements. The area will become an industrial growth centre hence the project is encompasses activities that are out of character with the surroundings as the land use will change from agricultural and pastoralist to industrial and agricultural respectively. It is for this reason that this ESIA is carried out. The development will be of a structure of a scale not in keeping with its surrounding and will encompass the establishment of an industrial estate. It is therefore included in the projects in Schedule 2 of the EMCA (Amendment 2015) that require an Environmental Impact Assessment. The proponent has contracted EIA Experts to carry out this study report.

Sukari Industries Limited being the project proponent therefore procured the services of the consultant on her behalf, to produce this Environmental Impact Assessment Study Report as required.

1.3. Scope of the Environmental Impact Assessment (EIA)

The Kenyan Government policy on all new projects, programs or activities requires that an environmental impact assessment is carried out at the planning stages of the proposed undertaking to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation and decommissioning of the Project. The scope of this Environmental Impact Assessment covered:

- The baseline environmental conditions of the EIA study area;
- Description of the proposed Project;
- Provisions of the relevant environmental laws;
- Public consultation through interviews and administration of questionnaires;
- Identification and discussion of any adverse social and environmental impacts anticipated

from the proposed Project;

- Appropriate mitigation measures; and
- Provision of an Environmental Management Plan outline.

The output of this work led to this Environmental Impact Assessment Study Report forpurposes of applying for an EIA license as per the law.

1.4. Objectives of Environmental Impact Assessment

The objectives of the Environmental Impact Assessment (EIA) are:

i. To fulfill the legal requirements as outlined in Section 58 to 67 of EMCA cap 387 and Part I and II of the EIA/Audit Regulations, 2003;
ii. To assess and predict the potential impacts during site preparation, construction and operational phases of the proposed project;
iii. To determine mitigation measures for the identified impacts
iv. To make suggestions of possible alterations to the proposed design, based on the assessment findings;
v. To allow for public participation;
vi. To prepare an Environmental Management Plan.

1.5. Terms of Reference (TOR) for the EIA process

The TOR for this Environmental Impact Assessment is based on the Environmental (Impact Assessment and Audit) Regulations dated June 2003. The following were the terms of reference:

i. Project Objectives
ii. Prepare the TOR for submission to NEMA for consideration and approval.
iii. Hold meetings with the project proponent, and other stakeholders including community
iv. Provide a description of project activities throughout the entire implementation process with a special focus on potential impacts to the surrounding environment and facilities.
v. Description of the baseline environment: This description will consider:
    - Physical environment which include topography, soils, land cover, land use, climate, hydrology, drainage and sound levels.
    - Biological environment comprising of flora and fauna types and diversity, endangered species, sensitive habitats.
    - Social and cultural environment present.
    - Economic activities
vi. Analyze and describe all occupational health and safety concerns brought about by activities during all the phases of the project and give recommendations on corrective and remedial

measures to be implemented under the environmental management plan.

vii. Analyze and describe all significant changes brought about by each project activity. These would encompass environmental, ecological and social impacts, both positive and negative, as a result of each facility/activity intervention that are likely to bring about changes in the baseline environmental and social conditions.

viii. Recommend specific environmentally sound and affordable mitigation measure for the identified impacts

ix. Identify and describe the pertinent and relevant regulations and standards for the proposed sugar factory - both local and international, governing the environmental quality, health and safety, protection of sensitive areas, land use control at the national and local levels and ecological and socio-economic issues. The project activities that comply with the identified regulations will also be detailed.

x. Development of an Environmental Management/Monitoring Plan proposing measures for eliminating, minimizing/mitigating adverse impacts on the environment.

xi. Analyze project alternatives including project site, design and technologies and reasons for preferring the chosen technology and processes.

xii. Produce an Environmental & Social Impact Assessment report that contain among other issues potential negative and positive impacts and recommendation of appropriate mitigation measures to minimize or prevent adverse impacts.

xiii. Submit the report for approval by NEMA. Such other matter as NEMA may require.

1.6. Methodology of the Environmental Impact Assessment

The Environmental Impact Assessment (EIA) was carried out based on field assessments, public consultations with the community within the project area, engagement with relevant stakeholders and briefs from the proponent. The data collection was carried out through structured questionnaires, interviews and observations during site visits and review of relevant document.

Potential negative impacts and their mitigation measures during construction, operation and decommissioning of the proposed Project were taken into consideration during the study.

1.6.1. Desktop study

A desktop study was conducted to review available published and unpublished reports, development plans and maps in order to compile relevant baseline biophysical and socio- economic information about the study area.

1.6.2. Field survey

Field visits were conducted in the study area in order to collect site-specific information on the biophysical and socio-economic environment and to cross-check the secondary data that had been compiled during the desktop studies. While at the site, environmental data were recorded and potential impacts identified. In addition, environmental features water and soil and ecological aspects within the site were noted and photographs taken as record of key features.

1.6.3. Public consultation

Public consultations were undertaken through meetings with the community various project stakeholders, a structured questionnaire administering and interviews. The consultations were meant to give an indication of whether the proposed Project is welcome and the perceptions the affected parties had on the project.

1.6.4. Impact analysis Reporting and documentation

All the information obtained above was analyzed and the report compiled to come up with the draft final ESIA report. This report was presented to the stakeholders for their comments before finalization of the ESIA Report

The proponent was continually informed throughout the period of report preparation to ensure that he was aware of the issues raised and the recommendations that were likely to be made regarding the best practices to mitigate environmental impacts.

TEAM OF EXPERT ENGAGED IN THIS STUDY REPORT

	Name	**QUALIFICATIONS**
1.	Kibathi G. Jerald	BSC. Environmental science NEMA LICENSED EIA/EA lead expert Reg No 1817
2	Alan Ojwang	BSC. Environmental Science with Information Technology NEMA LICENSED EIA/EA associate expert Reg. No 5144
3	Kepha Owinga	BSC. Social Science in BA (Anthropology) degree, Has been a social safeguard focal person for all the World Bank Projects in Migori County
4	Lydia Chacha Wamuyu	BSc. Environmental science Field assistant
5	S. Rajendran	KENYA heading the processing department at Sukari Industries: Limited, Ndhiwa. Processed 2.50 million tons of cane crushed with minimized losses and actively coordinated with expansion activities from 1500tcd to 5000tcd
6	Moses Apunda	The Company (Proponent) Lead Expert and Engineer

1.7. Structure of the EIA study Report

The structure of this EIA study Report is as follows:

DeclarationAcronyms

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Non-technical summary

Chapter 1: **Introduction**. This Chapter describes the background and rationale for an EIA, scope of the EIA, objectives of EIA, TOR, methodology of the EIA, consultant's compliance and reporting and documentation.

Chapter 2: **Project description**. Describes the nature and design components of the Project, proposed Project activities, Project materials and products and estimated Project cost.

Chapter 3: **Environmental setting of the study area.** This section provides a description of the existing environment to achieve an understanding of the environmental setting.

Chapter 4: **Policy, legal and administrative framework**. This Chapter outlines Government policy on the environment, the relevant legislation relating to the proposed Project and the administrative framework that deal with various aspects of environmental management.

Chapter 5: **Public consultation and participation.** It describes the public consultations that took place with the neighbours of the proposed Project site and stakeholders.

Chapter 6: **Analyses of Project alternatives.** The Chapter describes the various alternatives that can be applicable to the proposed Project and the reasons for not using them. It also discusses the no project alternatives.

Chapter 7: **Identification of potential impacts and their mitigation measures**. It identifies the potential impacts on the bio-physical and socio-economic environment during construction, operation and decommissioning phases. The chapter also describes the mitigation measures for the anticipated negative impacts identified during construction, operation and decommissioning phases.

Chapter 8: **Environmental management plan**. It describes the measures to be taken and the monitoring requirements and responsibilities for mitigating the potential negative impacts. It also indicates the estimated costs for mitigating the impacts.

Chapter 9: **Conclusion and recommendations**. It provides a brief non-technical summary of the report findings and recommendations.

References

Annexes

CHAPTER 2: PROJECT DESCRIPTION

2.1. INTRODUCTION

The proponent wishes to establish a sugar mill factory at the project site which hitherto has been agricultural. The proposed Sugar Factory project will initially contain sugar-milling and processing equipment complete with power generation needed for production. The factory will process approximately 3,000 tons of sugarcane daily.

2.2. JUSTIFICATION AND THE OBJECTIVE OF THE PROJECT

Since its inception, Sukari Industries sugar processing factory has expanded its sugarcane collection area to Transmara region in Narok County. This is because of its relationship with sugarcane farmers, the inputs they give to farmers, timely payment, the good sugarcane price they offer to farmers, well distributed sugarcane collection centres amongst other related services that they offer to the farmers.

Due to these wide sugarcane catchment area coupled with high fuel cost and the nature of roads, the factory and the farmers have been inconvenienced and faced a big challenge in terms of sugar cane transportation to the factory in Ndhiwa for milling.

It is for this challenge that the company deemed it fit to establish a sugar milling factory in Transmara South of Narok County to shorten the distance covered and the cost incurred in transporting the cane to the current sugar factory in Ndhiwa which is approximately 60km away.

Therefore the proposed project has the overall objective of developing a sugarcane processing plant to:

a) Serve many farmers from the area whose canes are delayed to be harvested since the millers are not able to reach them in good time due to distance and cost involved.
b) Be able to put the land which is lying fallow into use for economic gain and growth of the area

However, the company will also encourage the community to invest in sugar cane farming and will assist them with farming requirements including inputs and technical capacitation. The project area is agricultural and a number of farmers are already farming sugarcane. The soil and climate is good and land is also available for sugarcane farming.

2.3. PROJECT DESCRIPTION

2.3.1. Nature of the Project

The project involves a new vacuum pan plant consisting of a 3,000 TCD sugar milling plant, with possibilities of upgrading to a 6,000-tcd capacity. The vacuum pan process employs intermediate automatic technology, which is, not labour intensive, and requires no more than medium level production staff cadres for its operation and maintenance. It captures a high percentage of sugar in molasses such that no product is wasted, thus making the project more viable and cost effective. This inevitably results in low production overheads and ultimately low pricing of products at the consumer end.

2.3.2. Project Components

i. Land

The proposed project has already procured a 20.195 hectare parcel of land to construct the envisaged 3,000-tcd factory and at the same time the staff quarter for technical and managerial staffs. Additional land parcels will be acquired at appropriate time for further expansion.

ii. Buildings

The total factory will be constructed using locally available materials including blocks, cement, ballast and timber, all obtained from nearby suppliers or from Migori or Narok Counties. The buildings to be constructed will mainly consist of the factory structures and the following:

a) Workshops,
b) Administrative offices,
c) Weighbridge house,
d) Cane yard,
e) Mill House,
f) Power house,
g) Sugar house/warehouse,
h) Agriculture offices
i) Staff Houses, and
j) Stores

The factory will be surrounded by a 7 feet high perimeter wall.

The factory buildings will be constructed in accordance with the machinery supplier's specifications and the architectural plans layout. All the constructions will be done under the guidance of the Project Engineer.

The construction of the new factory building shall consist of concrete stub column bases as designed in

structural drawings. The factory walling shall be fabricated from mild steel universal beams sizes of 240mm x 240mm x 89kg/m which shall include the bracings as necessary to contain the iron sheet cladding in IT5 profile. The roof of the factory shall be of steel trusses with roof covering iron sheets in IT4 profile secured onto Z purlins.

The UC 'H' beams, wall height approximately 12meters high and shall be welded together with mounting plates drilled and bolted to RC concrete stub column bases. The factory floor shall be reinforced by BRC, A142 mesh.

iii. Machinery & Equipment

The vacuum pan sugar plant and the additional machinery, equipment for sugarcane handling and processing are to be imported from a reputable supplier. The sugar processing plant will consist of:-

a) Cane handling and preparation equipment,
b) Milling tandem,
c) Bagasse handling facilities,
d) Vacuum pan plant
e) Boiling house,
f) Milling house,
g) Gantry and cane yard
h) Powerhouses,
i) Sugar house,
j) Boiler house,
k) Crystallizers,
l) Sugar hopper,
m) Sugar dryer,
n) Rotary filter,
o) Centrifugal machines,
p) Molasses storage tank of 800,000 liters,
q) Bagging facilities,
r) Workshop,
s) Laboratory equipment and
t) Spares

Other equipment such as tractors, trailers, Lorries and motor vehicles among other supportive components form part of the machinery and equipment for the project.

iv. Effluent Treatment Plant (ETP)

The company shall construct an effluent treatment (ETP) plant with imported equipment. Waste Disposal Liquid wastes from the rotary vacuum filtration section and any other areas shall be passed through an effluent treatment works with a design capacity of about 497 m3. The works shall consist of a screening chamber, two (2) primary chambers and a secondary chamber. After being subjected to the line separation and treatment processes, the effluents shall then be treated to acceptable BOD levels among other standards prescribed by NEMA before being discharged to River Mugor that is about 50 m from the factory premises.

For grey water, the factory will construct a sizeable septic tank and soak pit that will collect all sewage and kitchen sludge at a suitable location within the factory (residential area). It will ensure that the septic tank is exhausted by NEMA registered exhausters to be dumped into a licensed sewerage facility.

Solid wastes such as press mud and other factory wastes (up to 1,600 kg within one month of factory operation) shall be disposed off in the farming fields within the project area, as they are biodegradable and are organically rich matter. Particularly the press mud can be used to reduce the use of chemical fertilizer as it is an excellent soil conditioner. For non-bio-degradable matter, disposal will be left to NEMA registered waste collectors e.g. waste chemical and fertilizer containers, waste papers, used materials, waste packaging materials, kitchen and domestic wastes etc.

v. Aerial Pollution Control and Fuel Reduction Options

There shall be smoke produced from the Plant in the form of a mixture of some particulate matter and gases such as carbon dioxide and others like, H2S and CO. The effect of this shall however, be minimized if discharged through high elevation steel chimneys constructed to a height of about 25m as recommended by the Factories Act. It will have electrostatic precipitator to clean the emission.

The factory plant shall only use bagasse and firewood for furnace starter operations, hence implying minimal smoking and wood (forest) saving measures. Bagasse shall be the main source of fuel for processing, with its combustion being in a closed environment thus making it possible for complete combustion to occur and hence allowing for higher energy saving and minimal aerial discharges.

vi. Fire Fighting Equipment

The factory will install a fire ring line along the factory perimeter with risers equipped with hydrants and break glass points holding 30m long fire hoses. The ring line will be connected to a 200m^3 water tank with an automatic pump that will be used for firefighting in case of a fire outbreak. The boiler and the bagasse yard will be equipped with firefighting sprinklers overhead with automatic nozzles that will

release powerful jets of water to quench any fires in these areas backed up by the fire ring line. Other firefighting equipment will include a fire alarm; various types of firefighting canisters mounted along the walls of the buildings and fire hoses with lengths of 30 meters in strategic places in the factory and the factory grounds.

vii. Manpower Requirement

Manpower requirements will be in two phases; construction and operation phases. Construction phase will include manpower employed by the contractor hence their engagement will end at the completion of the project. Manpower during operation phase are divided into two: Permanent and casual with actual requirement of approximately 300 - 400 people**.**

viii. Infrastructure, utilities and amenities

a). Roads

This will consist of the road connecting the site to Kehancha – Lolgorian Road and routes within the factory. These reads will be opened up and graded then graveled. The total roads network within the factory site will be about 2 kilometers and will include a weighbridge located adjacent to the sugar mill entrance where cane and products will be weighed. The access road to the site as from Kehancha – Lolgorian Road measures approximately 1km.

b). Electricity

Electricity will be transmitted to the project site by a single circuit transmission gridline at 33 kV to the power sub-station. This will involve putting up wooden poles by Kenya Power and Lighting to the nearest KPL 33 KV line. The electricity will then be stepped down to 440 volts - three phase, before being distributed to the sugar factory and other units within the project. The factory will also generate its own power (4mw) once it has started operation. But for the start, the company will use KPLC electricity as herein described.

c). Water

Water will also be sourced from the Mugor River for factory / processing use. Water will be pumped up to a sedimentation tank near the factory. The sedimentation tank will have a capacity of 200m^3. Aluminum sulphate will be added at this point to allow sedimentation and the resultant clear water then pumped into the sugar factory and for other uses. The river will also be the source for water during the construction phase.

For domestic use a borehole will be sunk to a depth as recommended by Hydrological/Geophysical Survey Expert and approvals from WRA. After the test pumping and requisite chemical and bacteriological tests the borehole will be equipped with a master meter and piezometer to monitor abstraction and water rest levels respectively.

d). Communications technology

Communication and information technology in the project area is well developed. Internet mobile telephone facilities are available. Three companies; Safaricom, Airtel and Telcom provide wireless telephone.

2.3.3. Project Activities

i). Planning and designing phase

Before implementation, the project will require planning, designing and ensuring that the project is approved by all the relevant offices. Currently the site is not having any human settlement hence it doesn't require relocation of persons.

After approvals, the construction tender shall then be awarded to a contractor who will then move to the site to prepare it for the construction works. The proposed project site is verse enough for the project hence there will be no need of getting extra plot. The site will therefore be cleared; vegetation, after which contractor will put up his site office and erect a construction board indicating the kind of project, work and professionals involved including all the approval acquired. As such the site will be handed over to the contractor until the end of construction work.

ii). Construction phase

The factory buildings will be constructed in accordance with the machinery supplier's specifications and the architectural plans layout. All the constructions will be done under the guidance of the Project Engineer. It will involve the following activities:-

a). Sourcing and transportation of building, materials

Building materials will be transported to the project site from their extraction, manufacture or storage site using transport tracks. While the sourcing of the materials will be done from Narok County and neighboring regions/counties, great emphasis will be laid on procurement of material from within the local area which will make both economic and environmental sense as it will reduce negative impacts of long distance transportation of material to the project site. In case where materials are not available locally or nationally, they will be sourced oversea and transported by an appropriate means to the construction site.

b). Storage of materials

Bulky building materials such as rough stones, ballast, stones, and steel will be carefully pilled on site. Contractor will also put up a temporary structure where some equipment and materials such as paints, cements and others that are vulnerable to weather will be stored.

c). Excavation and foundation work

Excavation will be carried out to level the ground, prepare the site for construction of foundations, pavements, drainage system, boat rowing water pool, septic system. Use of heavy earthmoving machinery will be necessary more so when excavating the ground.

d). Masonry, concrete, steel works and related activities

The construction of the factory and all its related components will involve a lot of masonry works and related activities. General masonry and related activities will include stone shaping, concrete mixing, plastering, slab construction and curing of fresh concrete surfaces. These activities are known to be labour intensive hence will be supplemented by machinery such as concrete mixers and vibrators.

A lot of steel and civil works including sheet metal cutting, raising the roofing such as galvanized iron sheets, structural steels columns and trusts to the roof and fastening as will be undertaken.

As such all the component of the project will be constructed as detailed in the approved structural and architectural plans. This will also be to the satisfaction of the proponent and all the approving authorities / agencies.

e). Plumbing

Installation of pipe work for water distribution, foul water and storm water draining will be carried out within the project components. Plumbing will include wire and plastic cutting, the use of adhesives, metal grinding and wall drilling among others.

f). Electrical Work

Electrical work during construction of the premises will include installation of electrical gadgets and appliances including electrical cables, lighting apparatus, sockets etc. In addition, there will be other activities involving the use of electricity such as welding and metal cutting.

g). Removal of construction wastes from the sites

Once the construction will be complete, all waste generated at the site and remaining surplus materials will be removed for recycling, reuse in other projects or for safe disposal at a legal disposal site.

h). Landscaping

To improve the aesthetic value or visual quality of the factory once construction ceases, the proponent through contractor will carry out landscaping. This will include planting of trees, flowers grass and hedges as will be applicable. It is noteworthy that the proponent will use plant species that are available locally preferably indigenous ones for landscaping.

i). Government inspection

For occupancy, the factory will be inspected under OSHA and occupation certificate and completion of works issued.

iii). Operation phase

The company's operations will include the following: -

a) Collection and transportation of sugarcane from out-growers' fields/farmers to the factory;
b) Receiving sugar cane from farmers
c) Processing the sugarcane to white and brown sugar; and
d) Generating electricity;

a) Cane Processing

The milling of cane and the processing of sugar will generally have sequence below: -

b) Cane Handling Weighbridge

Sugar care will be received at the factory premises in trucks and trailers via the weighbridge and the weight recorded by weighbridge clerks. It will then be off loaded at the cane yard by the gantry cranes, while care taken is taken to ensure that the trash and other extraneous materials are removed from the cane, before loading the product on the cane table awaiting paddling. During this stage care is taken to ensure that cane is kept fresh, that is for not more than 48hrs after harvesting. Laboratory tests will be carried out to establish brix, pol, etc before cane is offloaded onto the mill. Old and fibrous cane will be rejected at the cane yard.

c) Extraction of juice

The process of extraction of juice starts with the cane passing through a series of cuts into chips, then through a crusher, a succession of rollers mostly four to six stage rollers in a row. The mills recommended for this project are of modern design, equipped with turbine drive, special feeding devices, efficient compound imbibition system etc. In the best milling practice, more than 95% of the sugar in the cane goes into the juice. A by-product of this process is a residue called bagasse; a fibrous residue with a low sucrose content. In each ton of sugarcane processed, bagasse will be between 25 to 30% of the total cane.

d) Clarification

Dark-green acidic turbid juice, extracted from the process above is raw juice. This raw juice will be taken through a heating temperature as high as 65 to 75 degrees Celsius before being treated with phosphoric acid, sulphur dioxide & milk of lime to remove impurities. The treated juice, on boiling, is fed to continuous clarifier from which the clear juice is decanted while the settled impurities known as mud is sent to the field as fertilizer. The clear juice goes to the evaporators without further treatment.

e) Evaporation

The clarified juice contains about 85 % water. About 75% of this water is evaporated in vacuum multiple effects consisting of a succession of four increasing vacuum boiling cells. The vapours from the final body go to condenser. The syrup leaves the last body continuously with about 60% solids & 40% water.

f) Crystallization

The syrup received from the evaporation process will be treated with sulphur dioxide after which it is sent to the pan station for crystallization of sugar. In this stage syrup is evaporated until saturated with sugar.

g) Centrifugation

The suspension of sugar crystals (massecuite) received from the crystallizer is deposited into revolving machines called centrifuges. The perforated lining retains the sugar crystals, which may be washed with water if desired. The mother liquor „molasses" passes through the lining because of the centrifugal force exerted & after the sugar is „Purged". It is cut down leaving the centrifuge ready for another charge of massecuite. Continuous centrifuges may purge low grades. The mother liquor separated from commercial sugar is again sent to a pan for boiling and re-crystallization. Three stages of re-crystallization are adopted to ensure maximum recovery of sugar in crystal form. The molasses produced will be pumped to the molasses storage tank as a by-product used for animal feed etc.

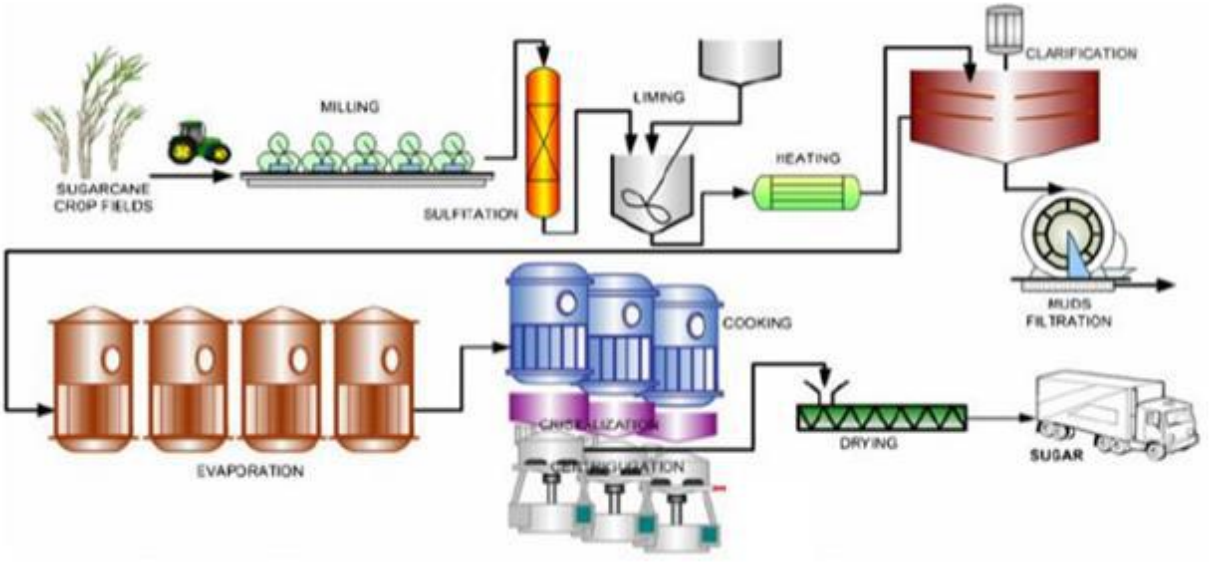
In the sugar drier hot air will be blown on to the, sugar leaving the batch centrifugals to dry it. Drying will occur in a multi-tray type dryer with a hot air blowing arrangement. Big sugar lumps will be separated in last section of the tray. The sugar production system consists of three levels that is "A", "B" and "C" massecutes, with sugar and molasses at all these levels. Only sugar "A" is marketed for human consumption while molasses "C" being the final by-product is used for various purposes

Sugar will then be cooled, sieved and conveyed to warehouse / store before packaging for sale.

i. Co-Generation

The company proposes to establish a bagasse based 4 MW Co-Gen Power Plant. This will be a simple three step process namely Water preparation, Steam Generation and Power Generation.

Figure 1: sugar processing flow chat



iv) Factory Maintenance

The milling process will normally run for 330 days per year, with monthly shutdowns of approximately 24 hours for servicing, cleaning/maintenance. These activities will include cleaning of heat exchangers, lubrication, repairs and general cleaning. During the one months off crop for replacement/rebuilding of wearing parts like mill rollers and general maintenance on all equipment and machinery will be done.

v) Description of the Project's Decommissioning Activities

The proponent has no intension of decommissioning the factory in near futures. However, a number of factors / reasons may contribute to the need for decommissioning. This may include:- an order by a court of law, Natural calamities or Proponent; the proponent deeming it necessary to put up a more value adding project / facility.

In case there will be a need for decommissioning, the proponent will undertake all the decommissioning activities that will ensure decommissioning is done in an environmentally friendly manner and the site is returned to its original state as much as practicable. A decommissioning plan will be prepared and submitted to the relevant departments in for approval.

i. Once the decommissioning plan is approved the decommissioning activities will involve:- informing the relevant authorities, stakeholders and farmers on the plan to decommission the factory, reasons for decommissioning and alternative factory or plan for farmers sugar cane.
ii. Paying employees of all their due and then Laying them off
iii. Dismantling company components including machines, equipment for use in another project or for selling
iv. Demolition of the remaining components including pavements, buildings, Drainage systems

and any other component as it will be deemed necessary.

v. Clearing the site by removing all the wastes and any component on it. Proponent / decommissioning contractor to put measures for management of the same that will involve recycling, reuse and proper disposal.

vi. Once all wastes are removed from the site, restoration will then take place.

In case the site is proposed for another project then a feasibility study and EIA will be undertaken to guide on the extent to which demolition can be done and what facilities can be retained to be used in the new project.

2.4. BY-PRODUCTS

a) Molasses

b) Bagasse

The other by-product from the cane milling process is a fibre material known as bagasse. From the proposed milling process, it is expected that the bagasse content will be about 425 kg out of every 1000 kg of cane crushed in a day.

The bagasse shall be used as fuel while any excess amounts can be used for the purposes of making charcoal briquettes for domestic fuel or sold out for those who may reuse it.

c) Press Mud

The final by product of the process will be press mud from the rotary vacuum filtration area $36m^2$ section of the plant; this will be given to farmers as manure for the cane fields.

2.5. MATERIALS REQUIRED

a) Cane:

The factory will utilize some 3000 tcd, which will be obtained from individual out growers.

b) Water:

The Mugor River is a perennial surface water source of good quality water and can be used both for industrial and domestic purposes. In terms of the latter, it is seen that a number of households do also use roof catchments as an alternative water source. A borehole will also be drilled to supplement river water for domestic use.

An active water management proposal geared at realizing productivity and profits as well as efficient water use by the factory shall abstract some 50,000 litres of water per day from River Mugor that is just adjacent to the factory site. A strategic water supply for the factory is also desirable for purposes of emergencies and maintenance and also for quality control.

c) Fuel:

The factory intends to use minimal oil-based fuels and bagasse in its steam boiler of 25MCR/hr except for start-up operations. As such, the main fuel source in the factory is expected to be bagasse that is a by-product of the cane crushing translating to approximately 3,160kg per day process in the same plant.

Electricity will only be used in the factory to run machinery that only requires electrical power for their operation, for lighting and provision of heat for the sugar dryers. This is energy conservation measure.

d) Sulphur and Milk of Liming:

Sulphur will be used in the sulphitation process for bleaching the raw juice. The rate of application of sulphur shall be 0.075 kg per 83 kg of raw juice. For lime, about 1 kg of this chemical will be used for every 83 kg of raw juice in the juice clarification process. After the sulphitation and liming process the total juice weight will increase from 83 kg to 84.075 kg. Sulphitation is the process of purification of cane juice by employing lime and sulphur dioxide gas.

2.6. PROJECT COST

The construction of the proposed Sugar Factory complex is estimated to cost 5,132,000,000.00/=. Five billion, One Hundred Thirty Two Million only.

CHAPTER 3
PROJECT AREA ENVIRONMENTAL BASELINE INFORMATION

3.1. Background

The proposed Sukari Industries limited sugar factory is to be developed on plot No Transmara / Moyoi / 1908 located in Lolgorian division, Moyoi location, Moyoi Ward, Transmara South sub county (hived from formerly Transmara West sub County) - Narok County. The project site is within Transmara sugar belt region that commands a volume of cane in the region. The site is off Kehancha – Lolgoria / Maasai Mara road at the point River Mugor / Migori crosses Kehancha – Lolgoria road. The site is on Latitude 1°12'34.55"S and longitude 34°42'22.88"E.

3.2. Physical environmental setting

3.2.1. Climate

i. Rainfall

The rainfall amount and regime are influenced by the passage of inter-Tropical Convergence Zone (ITCZ) giving rise to a bi-modal rainfall pattern. The breezes from Lake Victoria add to the moisture levels. Hailstorms are occasionally reported in the West and the highlands north of Transmara West Sub-County in Narok County. Rainfall is bimodal. The long rains in the study area are experienced between February and June reaching its peak in April, while the short rains are experienced between August and November. The areas which receive a lot of rainfall are the highland West and North of Kilgoris Ward. Kilgoris and Lolgorian receive a mean annual rainfall of 721.6mm.

ii. Temperature

With regard to temperature, the Transmara West Sub-County in Narok County enjoys medium temperatures ranging from 14.8°C to 20.3°C. The highest temperatures occur in February and the lowest in June/July. This range of temperature is as a result of the influence of the high altitude in the sub-county. Other modifying factors are cool winds blowing from Lake Victoria mainly from the month of August and November and also between February and April.

The annual Evaporation is estimated at 1585mm with a minimum of 100mm in June and maximum of 259mm during January

3.2.2. Topography

The topography of the project area comprises of two major categories, the highlands which lie between 2200 and 2500m above the sea level and the plateau which rise from 1500 to 2200m above the sea level. The highlands consist of the Osupuko, Kapune, Meguara and Shankoe Hills in Pirrar and Kilgoris Ward and Keiyan and Nkararu Hills in Keiyan Ward. The plateau covers the eastern part in Kiridoni Ward, and the southern part in Lolgorian Ward. Parts of Maasai Mara, Murgan, Soit in Kirindoni Ward,

Masurura in Keiyan ward, Kerinkan, Olopikidogoe, Angata Barikoi and Lolgorian Ward also form part of the plateau. The terrain both on the highlands and on the plateau permit agricultural and livestock activities. Crop production is concentrated on the highlands while livestock development takes place on the lower grounds on the plateau. The Topography of the project site is gently sloping on an attitude of 1471m.a.s.l sloping to 1453m.a.s.l. to the River Mugor.

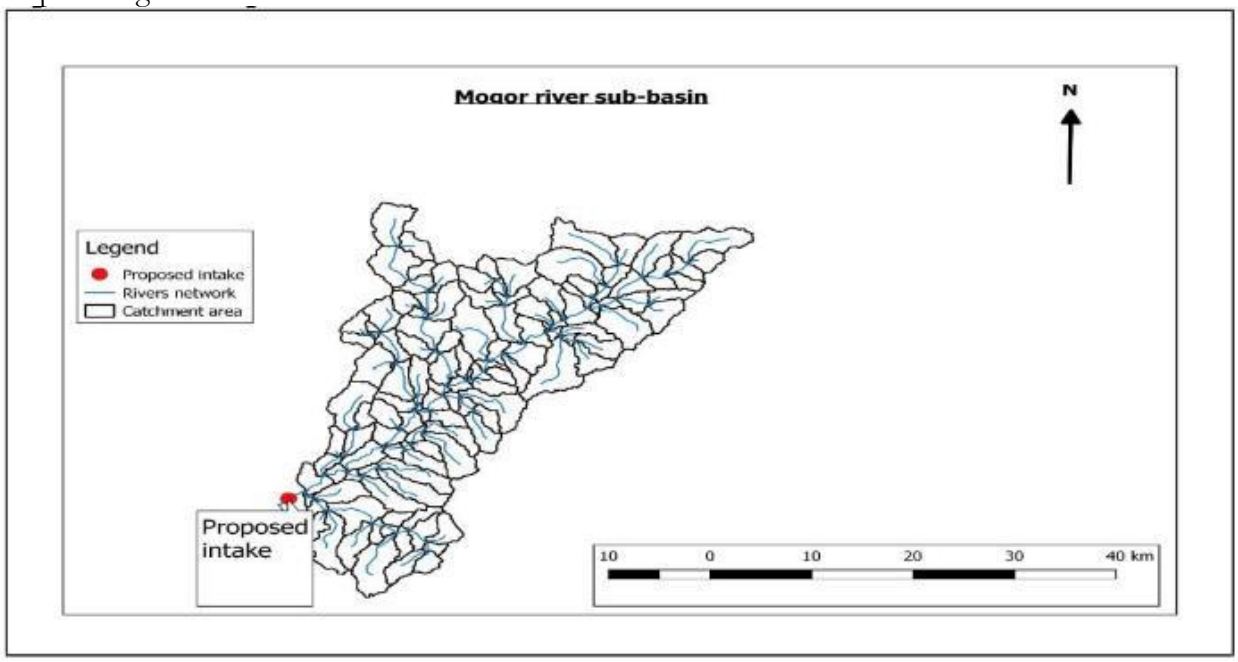
3.2.3. Soils and geology

Kilgoris Town is underlain by granites which is a type of intrusion. This is a hard rock mostly metamorphic in nature. The Kilgoris granites intrude gneisses of the Basement system and underlie Siria Plateau west of the Mara River. These are exposed west of Siria escarpment. These rocks are deeply weathered, sometimes faulted and fractured. Meanwhile, Lolgorian is located in a narrow zone of gold mineralization which runs through it in general East-South-Easterly direction. The project site comprises of deep black loam soil mixed with marrum and clay.

3.2.4. Hydrology and water resources

The project area has numerous sources of water ranging from major rivers, springs, shallow wells, pans and boreholes. River Migori (Mogor) is the main surface water body in the project area which serves the community for various purposes including domestic and agricultural uses. There are pans, dams, springs and shallow wells too. Few boreholes have been developed in the project area mainly at institutional levels. These water resources require conservation and development to sustain increased population.

Map 1: Mugor River sub basin



There are many small streams and rivers which drain into River Migori (Mugor). This includes River Steti that borders the site and drains its water into river Migori (Mugor) just at a point that borders the site. The project proposed to source industrial water from River Migor. However, due to continuous deforestation over a couple of years, the volume of water in the Rivers has been decreasing.

3.2.5. Land tenure system in the project area

Land ownership in Narok can be categorized into three main categories namely; community land, trust land and private land. The land tenure system in the project area is under both private and community land ownership. The land tenure system in Masurura location is under community tenure system while Moyoi location, where the proposed project is to be situated falls under private land tenure system. The project site (Land) is therefore registered under the name of the company: proponent.

3.3. Biological environmental setting

3.3.1. Fauna

The project area is in close proximity 30km (direct distance) to the south east from the boundary of the Maasai Mara Game Reserve It is thus not expected to directly interact with the protected area. It was however noted that the area still habour wild animals including, hyenas, antelopes, cheaters, snakes, wild birds, crocodiles in River Mugor. The density of wild animals was noted to be low as compared to other areas in Masai Mara game reserve. The animals only roam from evening through the night but not day time. There are also domesticated animals including domestic animals such as cows, sheep, and donkeys. Aquatic life found in River Mogor include: Catfish, Tilapia, Barbus sp, Carps sp, and, Haplochromis sp

3.3.2. Flora

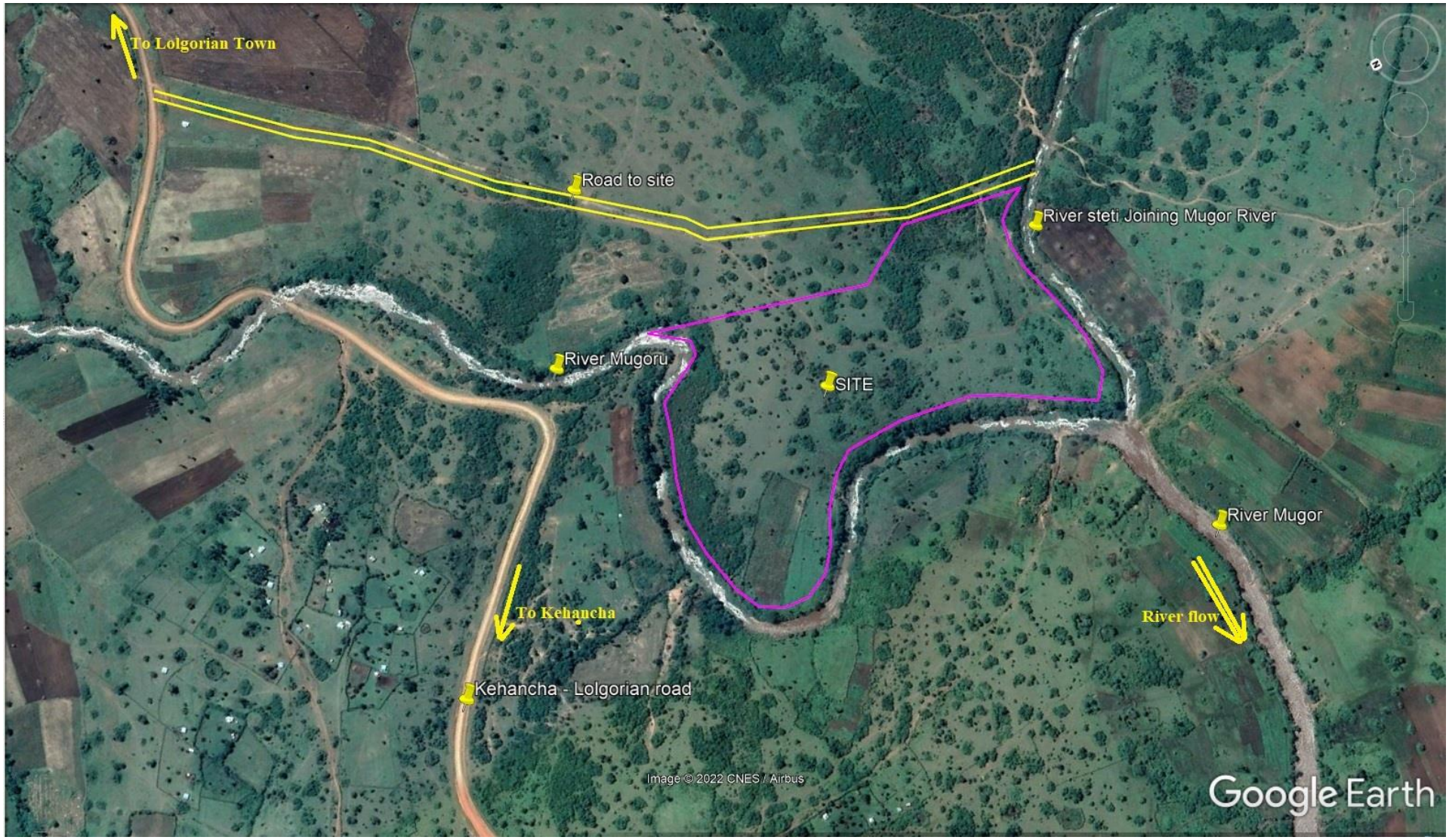
The County has an estimated 724Km2 of gazetted forest, 930 Km2 of non gazetted forest and 480 Km^2 of county council trust forest. The total area under forest cover represents 11.9 per cent of the total county surface area. In addition, Maasai Mara game reserve covers approximately 1,510 Km^2. Of this area 1,000 Km2 is in Narok South Sub County while 510 Km^2 of game reserve is in Transmara West Sub County and is famously referred to as Mara Triangle. The vegetation cover of these forests is mainly natural trees in the highland areas and shrubs and grasslands in the lowlands.

The area has experienced unprecedented shift in pastoralism as the major form of land use to crop production. Unlike in the past when most of the cultivation was by non-Maasai cultivators, most Maasai have now ventured into small as well as large scale farming. Land renting to farmers from outside Transmara on a short-term basis (usually one year) is also very common.

The project area is characterized by a semi-arid climate with wide valleys and escarpments. It has diversified vegetation that includes grassland, Acacia woodland, riverine vegetation's forest, crop farms / plantations, non-deciduous thickets, Acacia, Tarchonanthus and Croton Scrub. It was observed that vegetation at the proposed project site consisted of shrubs, acacia trees, indigenous trees, grass cover and crops; maize (majorly), beans, potatoes, sugarcane and coffee.

Plate 1: vegetation of the project site

MAP 2: GOOGLE MAP OF THE PROJECT SITE AND NEIGHBOURHOOD



Map 3: GOOGLE MAP OF PROJECT SITE, AREA AND DIRECTION TO THE SITE

3.4. Socio-economic setting

3.4.1. Administrative units

Administratively, Narok County has the following sub counties; - Transmara West currently subdivided into two; Transmara West and Transmara South, Transmara East, Narok North, Narok South, Narok West and Narok East. The sub-counties are further sub- divided into 16 divisions.

Table 1: Administrative sub-counties with areas in Kilometres square

S/NO	Sub-County	Area in Kilometres
1	Transmara West	2,526
2	Transmara East	320.5
3	Narok South	2,603.3
4	Narok West	5,452.7
5	Narok North	2,603.3
6	Narok East	2,059.5

3.4.2. Population and Settlement pattern

As per 2019 Kenya National Population and Housing census, Narok County has a population of 1,149,379 with the dominant ethnic groups being the Maasai and Kalenjin. This is an increase from 850,920 persons as per the 2009 by Kenya National Population and Housing Census. Trans Mara west; the project sub county has a population of 245,714 covering 2526km^2. Project area is however, sparsely populated with a concentration of settlement at Masusrura centre and the project site having no settlements. Population concentration is in major urban centres including Kilgoris and Lolgorian.

3.5. Economic activities

3.5.1. Agriculture

Livestock rearing is one of the main economic activities supporting the majority of rural household livelihoods in food security, employment and income generation. Previously cattle comprised of indigenous zebus for meat, milk and other cultural purposes. However, owing to increase in human population and competition from other agricultural enterprises (mainly crop farming) local communities have opted to diversify into keeping high quality breeds. Thus Boran, Sahiwal, exotic dairy breeds and their crosses are progressively becoming popular. Dairy value chain is growing faster under intensive and semi-intensive production systems.

Project area lies within rural sections hence dominated by the pastoral Maasai community. During the field study, we observed livestock including cows, goats and sheep being herded in search of pasture and water. Pastoralism is done in both large scale and small-scale.

Indigenous breed are the main livestock breed being reared in the project area although in the recent times, farmers are accepting to improve them using exotic breeds which are better performing in growth rates and production.

Crop farming is also major in the project area. During the field survey there was observation of crop farming. The crops observed included maize, beans, sugarcane, coffee, sweat potatoes, and a variety of vegetables including kales and African Nightshade (managu).

3.5.2. Trading

Lolgorian shopping is the most immediate and major urban Centre within the project area. It is robust with trading activities with a number of retailers and wholesalers operating in businesses ranging from general stores, hotels, eateries, hair salons, petrol stations and informal industries. It is rapidly growing due to gold mining and pastoralist activities and also due to the fact that it is the headquarter of Transmara South (after Transmara West was divided into two giving birth to Transmara West and Transmara South).

Although charcoal making is illegal, there was evidence of charcoal making and transportation within the area which suggests trade in charcoal. From feedback on the ground, it was reported that because of the fragmentation of land as a result of change of land tenure from group ranches to private land, there has been an increase in deforestation as people cut down trees and clear the land in order to build their houses to settle in. This has reportedly increased the charcoal making as it is a quick and profitable way of getting rid of the felled trees.

3.5.3. Mining

The project area experiences a lot of mining activities both in artisanal (small) scale and large-scale such as Kilimapesa and a number of china companies who the mine and process the mined ore to get the targeted mineral. Mining has attracted many people from the neighbouring counties and outside the country (Tanzania, Zimbabwe and congo). There are a number of mine shafts, leaching plants, Elution plants and amalgamation gold processing sites.

3.5.4. Tourism

Masai Mara Game Reserve falls within Narok County and straddles across the Kenya – Tanzania border to the south west. Across the border into Tanzania the Game Reserve is known as Serengeti. Wildlife present in the Game Reserve include Elephants, Lions, Cheetahs, Buffaloes, Antelopes, Hyenas, Rhinos, Leopards, Wildebeest and all kind of birds among others. The Game Reserve attracts both local and international tourists visiting for recreation and sport. Maasai Mara Game Reserve and

the Mara Triangle have neighbouring group ranches and conservancies. The reserves host several Hotels, tented camps, airstrips and balloon safaris. The reserve has highly contributed to the economic standards of the county through employment in the hotel industry, game ranging, revenue collection, beadwork, curio shops and cultural practices in the Manyattas among others. Most tourist pass along and across the project area to and from Tanzania.

3.6. Financial institutions

Financial institutions in the County include Banks such as Barclays, Chase, Equity, KCB and numerous other providers but in the form of banking agents. Microfinance institutions include Kenya women Finance Trust (KWFT), Agricultural Finance Cooperation (AFC) etc. M-pesa and other mobile money transfer services. It was however noted that the immediate town / shopping Centre; Lolgorian; has no Major Banking facility except Microfinance institutions and M-Pesa. Banks are in form of agents only. The project will therefore boost the establishment of Bank as moist of the transaction and payment of farmers will be done through banks.

3.7. Transport

Narok County has a road network of 4,602 KM out of which the national government is in charge of 1,348km and the county government takes 3,254 KM. From the network, approximately 185 Km is tarmacked, 1,510 KM is graveled and 2, 907 KM is earth road. The main challenge has been that during the rainy season some of the murram roads are rendered impassable. This has hindered most of highly agricultural areas from reaching their potential. The county has four air strips located at the Maasai Mara game reserve: - Serena, Keekorok, Olkiombo and Musiara and all of them are murramed. The air strips play a crucial role in tourism sector by increasing mobility of the tourist visiting the Maasai Mara game reserve.

Lolgorian is accessible from Narok through the C13 Road that connects to the Migori - Isebania tarmacked road and also the C17 Road from Kilgoris Town. The project site is accessed through Migori/kehancha – Narok/Lolgorian the C13 Road. The access road to the site as from Migori/kehancha – Narok/Lolgorian the C13 Road measures approximately 1km. Moyoi area also has an airstrip that is currently not in use. The bridge crossing the Mogor (Migori) River is; though stable, in state that is not user friendly as it is narrow and always covered by water during heavy rain. This do cause problem to transportation along the Migori/Kehancha – Narok/Lolgorian consequently, if not rehabilitated, it may hinder smooth transportation of sugar cane from Masurura location to the factory.

3.8. Energy

It was noted that the project site is not connected to KPLC electricity though the main power line runs along Migori/Kehancha – Narok/Lolgorian the C13 Road; about a kilometer from the site. Shopping centres within the project area are however connected to the KPLC grid. Those on the rural have dominated the use of solar energy as the cost of KPLC connection is very high. The project will be connected to the grid and at the same time it will generate its own power (4mw).

3.9. Land use

Land in the county can be classified into four broad categories based on land use. These are: Urban land, Conservancies, Maasai Mara Game Reserve and Arable.

Conservancies are found mainly around Maasai Mara ecosystem. These conservancies serve as dispersal and migratory corridors for wildlife from the Maasai Mara game Reserve. In total there is more than 352, 000 hectares of land under conservancies in the county, comprising more than ten conservancies. Among the biggest conservancies are Pardamat, Mara North, Mara Naboisho and Siana conservancies. Maasai Mara Game reserve on other hand accounts to approximately 1,510KM^2. The game reserve is home to the big five: elephants, buffaloes, rhinos, lions and cheetahs.

The arable land where most agricultural activity takes place is approximately 8,495.5km^2. This land is mainly in Mau region, Narok North areas, Nairege enkare in Narok East, bigger part of Emurrua Dikirr sub-county and Narok South and pockets of land in Northern part of Narok West Sub-County

The land use in the project area (Moyoi and the neighbouring Masurura Location) is mixed with agricultural; farming and pastoralism, residential; majorly homesteads, commercial; in shopping centres like Masurura, Loliondo and Lolgorian shopping centre, institutional like schools and churches, and industrial including mining and coffee factory.

The proposed project site is partly under farming and partly fallow and therefore the proposed project will change the land use pattern to industrial use and neighbouring land use to sugarcane farming.

3.10. Sites of cultural value

The project area and site has no sites of cultural value except graves for the community / family members which have intrinsic value. The project is likely not to interfere with these sites.

CHAPTER 4

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

4.1. GENERAL OVERVIEW

Regulation 18 (1) (b) of the Environmental (Impact Assessment and Audit) Regulations, 2003 requires an environmental impact assessment report to, among others; include a concise description of national environmental legislative and regulatory framework applicable to environmental management of the project being assessed. This chapter therefore presents a review of policy, legal and regulatory frameworks applicable to environmental management of the proposed Sukari Industries Sugar Factory Project at county, National and international levels.

Kenya Government has a wide range of policy, institutional and legislative frameworks to address the major environmental issues that emanate from industrial and economic development programs. It has therefore; put in place all the frameworks necessary for the legislative and regulatory controls of environmental management. Environmental Management and Coordination Act, EMCA Cap 387, amended in 2015 comprehensively address environmental issues which were being governed differently by the various sectoral acts.

4.2. POLICY FRAMEWORKS

4.2.1. Kenya Vision 2030

Vision 2030 is geared towards transformation of Kenya into an industrialized middle-income country by 2030. It is based on the 3 pillars of political, social and economic advancement and it aims to transform the economy and achieve sustainable growth.

Environmental considerations of development are contained within the social and economic pillar just like for Agriculture. It recognizes Agriculture as the mainstay of the country's economy with predominantly small-scale farmers who accounts for over 75% of agriculture output. The government on the other hand remains committed to improving agricultural productivity for food security, poverty reduction, employment and wealth creation. Vision 2030 further point out that food crop production makes significant contribution to food security and Gross Domestic Product.

Regarding environment, the Vision states that Kenya aims to be a nation living in a clean, secure and sustainable environment by 2030. This is through increasing forest cover, minimizing pollution and waste management through the design and application of economic incentives.

The proposed Sukari Sugar factory project will be in line with Vision 2030 in that it is geared towards promoting environmental conservation, pollution control, and proper waste management. The project also has a catchment management component, which aims at combating climate change.

4.2.2. Sustainable Development Goals (SDGs)

Sustainable Development goals which were initiated by world leaders in 2015 as an advancement of the Millennium Development Goals (MDGs) provide concrete, numerical benchmarks for tackling extreme poverty in its many dimensions. The SDGs also provide a framework for the entire international community to work together towards a common end making sure that human development reaches everyone, everywhere. If these goals are achieved, world poverty will reduce by half, tens of millions of lives will be saved, and billions more people will have the opportunity to benefit from the global economy.

Goals 6, 7, 13, 14 and 15 of the SDGs revolve around ensuring Environmental Sustainability. The goals highlight on; Combating climate change through the reforestation of degraded and degrading landscapes where by reforestation helps in strengthening community resilience to climate change; Protecting, restoring and promoting sustainable use of terrestrial ecosystem, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss and, Conservation and sustainable use of oceans, seas and marine resources

The proposed project will contribute towards alleviating rural poverty by increasing means of livelihood. The ESIA study will ensure that the proposed project reflects Environmental Sustainability especially during the time of construction and implementation.

4.2.3. National Environmental Action Plan (NEAP)

According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from industrial, economic and social development programmes that disregarded environmental sustainability. Under the NEAP process Environmental Impact Assessments were introduced targeting the industrialists, business community and local authorities.

The proposed Sukari Industries Sugar Factory will abide by this policy guideline by ensuring that the environmental and social baseline surveys are carried out and then an ESIA that will develop an Environmental Management and Monitoring Plan to manage the Environment and ensure that the post project period will have better environment than it was before the project.

4.2.4. Land Policy

The National Land Policy in section 3.4 on Environmental Management Principles provides for the policy actions for addressing the environmental problems such as the degradation of natural resources, soil erosion, and pollution of air, water and land. The policy advocates for environmental assessment and audit as a land management tool to ensure environmental impact assessments and audits are carried out on all land developments that may degrade the environment and take appropriate actions to correct the situation. Public participation has also been indicated as key in the monitoring and protection of the environment. Section 3.4.3.3 advocates for the Implementation of the polluter pays principle which ensures that polluters meet the cost of cleaning up the pollution they cause, and encourage use of cleaner production technologies. In section 131 (d) the government undertakes to provide mechanisms for resolving grievances arising from human/wildlife conflicts for sustainable management of land based natural resources.

The proposed project works shall implement the Environmental and Social Monitoring Plans to ensure that no rivers and streams within the project area are polluted by the subsequent activities during all project phases

4.2.5. Principles of Land use

From the constitution of Kenya 2010, Land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable, and in accordance with the following principles:-

a) Equitable access to land;
b) Security of land rights;
c) Sustainable and productive management of land resources;
d) Transparent and cost effective administration of land;
e) Sound conservation and protection of ecologically sensitive areas;
f) Elimination of gender discrimination in law, customs and practices related to land and property in land; and
g) Encouragement of communities to settle land disputes through recognized local community initiatives consistent with this Constitution.

The development of the proposed Sugar Factory project shall observe the above principles in its entire project cycle

4.2.6. Sessional Paper No. 6 (1999)

The key policy objectives of Sessional Paper No. 6 of 1999 include:

- Ensuring that all development projects at the inception stage and programs, as well as policies, consider environmental conditions;
- Ensuring that an EIA report is prepared for any undertaking or development project before implementation; and
- Coming up with effluent treatment standards that will conform with acceptable health guidelines;

It is important to note that issues of waste water management and human settlements are given prominence and, therefore, the policy recommends re-use and recycling, use of low waste generation technologies and increasing public awareness on the benefits of a clean environment. It also recognizes the role of stakeholders in all these initiatives within their localities.

This assessment has been undertaken to be in line with this sessional paper that requires EIA for proposed projects so that impacts can be identified and mitigated

4.2.7. National Environmental Policy, 2014

The National Environmental Policy is an outcome of the Sessional Paper No. 10 of 2014.The overall goal of the policy is to better quality of life for present and future generations through sustainable management and use of the environment and natural resources. One of the objectives of the policy is to promote and support research and capacity development as well as use of innovative environmental management tools such as Environmental Impact Assessments (EIAs) and Environmental Audits to ensure environmental quality and resource productivity on long term basis.

The policy among other important objectives calls for promotion of domestication, coordination and maximization of benefits from Strategic Multilateral Environmental Agreements (MEAs). The policy further calls for integration of environmental concerns into development policies, plans and activities.

The National Environmental Policy proposes a broad range of measures and actions responding to key environmental issues and challenges. It seeks to provide the framework for an integrated approach to planning and sustainable management of natural resources in the country. It recognizes the various vulnerable ecosystems and proposes various policy measures not only to mainstream sound environmental management practices in all sectors of society throughout the country but also recommends strong institutional and governance measures to support the achievement of the desired objectives and goal.

Relevance

The policy requires that projects such as this one, which are likely to have significant environmental and social impacts should be undertaken with sound environmental management plan. Thus, this ESIA report has been prepared as a tool for promoting environmental sustainability.

4.2.8. The National Biodiversity Strategy, 2007

It is a national framework of action to ensure that the present rate of biodiversity loss is reversed and the present levels of biological resources are maintained at sustainable levels for posterity.

The general objectives of the strategy are to conserve Kenya's biodiversity to sustainably use its components; to fairly and equitably share the benefits arising from the utilization of biological resources among the stakeholders; and to enhance technical and scientific cooperation nationally and internationally, including the exchange of information in support of biological conservation.

Relevance

Activities during the construction of the project infrastructure are bound to impact negatively on the flora on site. As such, during construction, the contractor will be required to reinstate the environment to reverse the loss of biodiversity or to maintain the levels of biological resources at sustainable levels for posterity.

4.2.9. The Sugar Policy

The Sugar policy as established is in line with the national objectives of national food policy, which are 'self-sufficient, food security, employment creation, income generation, foreign exchange earnings, stemming rural-urban migration, poverty alleviation and overall economic growth. Sugar plays a vital role in providing livelihoods, earning national revenues and incomes, creating employment and foreign exchange savings.

The Sugar sub-sector is a major enterprise therefore implementation of this vital industry will help alleviate unemployment through backward and forward linkages.

4.3. LEGAL FRAMEWORK

4.3.1. Constitution of Kenya, 2010

Environmental management and natural resources utilization is enshrined in the Kenya constitution 2010 under several articles.

Article 42 of Bill of Rights of the Kenyan Constitution provides that every Kenyan has a right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislation and other measures.

The right to a clean environment is further enforced by article 70. Article 186 and the fourth schedule allocate functions of natural resources management and environmental protection to both the national and county governments.

The principles of land policy that ensure land is held, used and managed in a manner that is equitable, efficient, productive and sustainable is set out in article 60 of the constitution. The proposed project is to be developed to ensure its efficient management and utilization of land.

According to Article 69 (2) "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.

Relevance

The constitution of Kenya provides for sound management and sustainable development of all of Kenya's projects, both public and private investments. It also calls for the duty given to the project proponent, in this case Sukari Industries Limited is to cooperate with State organs and other persons to protect and conserve the environment.

4.3.2. The Environmental Management and Coordination Act (EMCA) Cap 387

The EMCA Cap 387 provides the main legal and institutional framework under which the environment in general is to be managed. EMCA is implemented by the guiding principle that every person has a right to a clean and healthy environment and can seek redress through the High Court if this right has been, is likely to be or is being contravened.

Section 58 of the Act makes it a mandatory requirement for an EIA study to be carried out by proponents intending to implement projects specified in the Second Schedule of the Act. Such projects have a potential of causing significant impacts on the environment. Similarly, section 68 of the same Act requires operators of existing projects or undertakings to carry out Environmental Audits (EA) in order to determine the level of conformance with statements made during the EIA study. The proponent is required to submit the EIA and EA reports to NEMA for review and necessary action.

Relevance

This project has been categorized under high Risk Projects in the Second Schedule of the Environmental Management and Coordination (Amendment) Act 2015, which requires for the preparation of an ESIA project report prior to its implementation.

The following regulations under EMCA are also relevant to the proposed project;

a) EMC (Environmental Impact Assessment and Audit Regulations) 2003

The EIA and Audit Regulations state in Regulation 3 that "the regulations should apply to all policies, plans, programs, projects and activities specified in Part IV, Part V and the Second Schedule of the Act. Part II of the Regulations indicates the procedures to be taken during preparation, submission and approval of the full study report

Relevance

This report has been compiled in compliance with the regulations. The proponent will also be expected to carry out Environmental audit annually thereafter the completion of the project. The project is expected to obtain EIA License from NEMA before commencement. The proponent is also required to make sure that recommendation of the report are implemented / adhered to.

b) EMC (Water Quality) Regulations, 2006.

The Regulations provides for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells and other water sources). It is an offence under Regulation No. 4 (2), for any person to throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution.

Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards for effluent discharge into the environment.

Relevance

During the construction, operation phases of the project, there will be waste water and other liquid waste generated from the factory and residential area of the project. Rivers Mogor and Steti are the primary receptors for such waste in case of run off, the contractor and proponent shall therefore comply to all the requirements of this regulation.

c) EMC (Waste Management) Regulations, 2006

The regulations provide details on management (handling, storage, transportation, treatment and disposal) of various waste streams including: Domestic waste, Industrial waste, Hazardous and toxic waste, Pesticides and toxic substances, biomedical wastes and radioactive waste.

Regulation No. 4 (1) makes it an offence for any person to dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.

Regulation 5 (1) provides categories of cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated and they include:

(i) Improvement of production process through

- Conserving raw materials and energy;
- Eliminating the use of toxic raw materials and wastes; and
- Reducing toxic emissions and wastes.

(ii) Monitoring the product cycle from beginning to end by

- Identifying and eliminating potential negative impacts of the product;
- Enabling the recovery and re-use of the product where possible, and Reclamation and recycling; and
- Incorporating environmental concerns in the design and disposal of a product.

Regulation 6 requires waste generators to segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal.

Regulation 15 prohibits any industry from discharging or disposing of any untreated waste in any state into the environment.

Regulation 17 (1) makes it an offence for any person to engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by NEMA.

Relevance

The proposed project, during construction and operation phases will generate wastes which will need to be disposed as per the guidelines in the regulations.

d) EMC (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

The regulations provide information on the following:

i. Prohibition of excessive noise and vibration beyond defined thresholds;
ii. Provisions relating to noise from certain sources;
iii. Provisions relating to licensing procedures for certain activities with a potential of emitting excessive noise and/or vibrations; and
iv. Noise and excessive vibrations mapping.

According to regulation 3 (1), 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 First and Second Schedule stipulate the Maximum Permissible Intrusive Noise Levels and Maximum Permissible Levels for Construction Sites respectively.

Regulation 14 of these Regulations provides for noise, excessive vibrations from construction, demolition, mining or quarrying sites. Regulation 14 (1) states that *"Where defined work of construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose requirements on how the work is to be carried out including but not limited to requirements regarding-*

a. *machinery that may be used, and*

b. *the permitted levels of noise as stipulated in the Second and Third Schedules tothese Regulations".*

Regulation 14(3) further states that *"Any person carrying out construction, demolition, mining or quarrying works shall ensure that the vibration levels do not exceed 0.5 centimeters per second beyond any source property boundary or 30 meters from the moving source".*

Regulation 15 of these regulations states that *"Any person intending to carry out construction, demolition, mining or quarrying work shall, during the Environmental ImpactAssessment studies-*

(a) *identify natural resources, land uses or activities which may be affected by noise or excessive vibrations from the construction, demolition, mining or quarrying;*
(b) *determine the measures which are needed in the plans and specifications to minimize or eliminate adverse construction, demolition, mining or quarrying noise or vibration impacts; and*
(c) *incorporate the needed abatement measures in the plans and specification".*

Table 2:Maximum permissible noise levels for construction sites (measurement taken within the facility)

Facility		**Maximum Noise Level Permitted (Leq) in dB (A**	
		Day	**Night**
(i)	Health facilities, educationa institutions, homes for disabled etc.	60	35
(ii)	Residential	60	35
(iii)	Areas other than those prescribed in (i) and (ii)	75	65

Time Frame

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

Relevance

Noise and vibrations are expected during the construction phase of the project when excavation is ongoing as well as during operation when the machineries are operating. The contractor /sub-contractor for civil works and the factory management will be required to ensure compliance with the above regulations in order to promote a healthy and safe working environment throughout the project phases. This shall include regular inspection and maintenance of equipment and prohibition of unnecessary noise.

e) Environmental Management and Coordination (Air Quality) Regulations, 2014

These Regulations cover air quality standards that are requisite to protect human health and allow an adequate margin of safety. These Regulations specify priority air pollutants, mobile and stationary sources as well as stipulates emission standards.

Relevance

The emissions to be generated from construction and operation of the factory activities will have the potential of polluting the immediate atmospheric environment. Thus, need for strict adherence to these Regulations and standards therein in preventing possible pollutants and managing sources.

f) Wetlands, riverbanks, lakeshores and sea shore management regulations, 2009

This regulation covers special measure for protection of river banks including; prevention of soil erosion, siltation and water pollution Its objectives are among others:

i. To facilitate the sustainable utilization and conservation of resources on river banks;
ii. To promote the integration of sustainable use of resources in riverbanks; and
iii. To prevent siltation of rivers and lakes and control pollution or and other activities likely to degrade the environment.

Relevance

This project boarders River Mogor (Migori) and Steti and also involves abstracting water from river Mugor. This may have an impact on the aquatic life as a result of either the abstraction or pollution of the water through effluent discharge. The proposed activities must be in line with the stipulated regulations.

EMC (Conservation of Biological Diversity) Regulations, 2006

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

4.3.3. The Sugar Act 2001 (Revised 2012)

The legislative history of the Kenyan Sugar Industry as embedded in Legal Notice No. 32 of 1973, (commonly referred to as the Kenya Sugar Authority (KSA) order, 1973) clearly demonstrated the desire, at the time by the Government, to develop an umbrella body for the industry which for all practical purposes was a department of the Executive in the Ministry of Agriculture. It was recognized that the KSA Order was short of serving the interest of the people it was intended to serve. It was for these reasons that the Sugar Act, 2001 was enacted, with the intention of totally re-organizing the industry so as to effectively serve the millions of Kenyans who depend on it. Some of the pertinent provisions that are to be adhered to by the proponent are as cited hereunder:

Part III of the said Act deals with the requirements of license to operate a sugar mill, issuance of license and fees and registration of millers. Part v of the said Act deals with miscellaneous provisions on quality, safety and health control measures, safeguard measures, offenses and penalties.

Relevance

The project is a sugar factory and therefore it will be required to adhere to the provisions in this Act.

4.3.4. Water Act, 2016

This Act provides the guidelines for proper management of water, conservation and control of water resources to ensure the water resources are sustainable. Under this Act waste water, storm water, sewage systems and drainages are supposed to be put in design drawings in the building plan of the project components; This Act also prohibits water pollution by a developer in his/her area of jurisdiction. The proponent will ensure that appropriate measures to prevent pollution of underground and surface water resources are implemented throughout the project cycle. The proponent shall also seek the necessary approvals of sources of water supply to the proposed project site throughout the project cycle. The Act also provides for establishment of a Water Resource Authority, whose functions include:- Formulate and enforce standards, procedures and Regulations for the management and use of water resources and flood mitigation;

Section 25 (1) of this Act states that *"a permit shall be required for any of the following purposes:*

- Any use of water from a water resource, except as provided by Section 26;
- The drainage of any swamp or other land;
- The discharge of a pollutant into any water resource; and
- Any purpose, to be carried out in or in relation to a water resource, which is prescribed by rules made under this Act to be a purpose for which a permit is required".

Relevance

The project neighbours river Mogor and Steti and will source water from River Mugor (Migori) and therefore the proponent shall ensure that a Water abstraction permit for the project is obtained from WRA. The proponent will also be required to ensure that project activities throughout all phases do not cause pollution of the rivers and underground water

4.3.5. The Water Resources Management Rules, 2007

As a subsidiary to Water Act, 2002, a legislative supplement, The Water Resources Management Rules, 2007 was gazetted to guide all policies, plans, programmes and activities that are subject to the Water Act, 2002. The Water Resources Management Rules empower Water Resources Authority (WRA) to impose management controls on land use falling under riparian land. Part A of the Sixth Schedule: Conservation of Riparian and Catchment Areas Rules (Rule 116) define the riparian land on each side of a watercourse as a minimum of six metres or equal to the full width of the watercourse up to a maximum of thirty metres on either side of the bank. It further provides activities proscribed on riparian land as:

- Tillage or cultivation;
- Clearing of indigenous trees or vegetation;
- Building of permanent structures;
- Disposal of any form of waste within the riparian land;
- Excavation of soil or development of quarries;
- Planting of exotic species that may have adverse effect to the water resource;
- Any other activity that in the opinion of the Authority and other relevant stakeholders may degrade the watercourse

Relevance

The project borders river Steti and Mugor and therefore the proponent and the contractor must ensure that the proposed project adheres to these rules

4.3.6. Public Health Act (Cap 242)

The Public Health Act is the principle instrument for ensuring the health and safety of the people. Its core function is the prevention of disease, treatment and care of the sick (curative services) and control of nuisance.

During construction, nuisance is prohibited especially for all conditions liable to be injurious or dangerous to health. Section 118 outlines nuisance liable to be dealt with, i.e. accumulation or deposit of refuse, offal, manure or any other material that is offensive or injurious or dangerous to health, and an accumulation of stone, timber or other machine likely to harbor rats or rodents.

Section 126 rule 62 – Drainage and Latrine Rules

It is a statutory requirement that drainage, latrines, septic and conservancy tanks and any other pretreatment methods of sewage effluents seek written permission or/and approval from the local authority, and be built in conformity to provisions of sub-rules (a) to (e) of this section.

Relevance

The project construction and operation activities are bound to expose both workers and members of the general public to situations injurious to health. All activities of the project are thus expected to abide by this act to ensure a healthy environment.

4.3.7. Occupational Safety and Health Act, 2007

This is an Act of Parliament that provides for the safety, health and welfare of workers and all persons lawfully present at a work places.

(a) Health

Part VI of the Occupational Safety and Health Act, 2007, addresses provisions concerning health. These provisions are: cleanliness, overcrowding, ventilation, lighting, drainage of floors; and sanitary conveniences. These provisions are to be enforced by the Department of Occupational Health and Safety under the Ministry of Labour.

(b) Machinery Safety

Part VII of the Occupational Safety and Health Act, 2007 elaborately deals with machinery safety requirements, mainly from the point of view of avoiding accidents and injuries at work.

(c) Safety –General Provisions

Part VIII of the Occupational Safety and Health Act, 2007 describes safety general provisions including:-

- Section 77: Safe means of access and safe place of employment;
- Section 78: Fire Prevention;
- Section 79: Precautions in places where dangerous fumes are likely to be present;
- Section 81: Safety provisions in case of fire; and
- Section 82: Evacuation procedures.
- Part IX of the Occupational Safety and Health Act, 2007 also provides for Chemical
- Safety, Part X provides for Welfare – General Provisions, Part XI Health, Safety and Welfare.

4.3.8. Agricultural Act CAP 318 Revised 2012

An Act of Parliament 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.

Relevance

The project will utilise the sugar cane already planted in the area and will also encourage the community who are currently not growing sugarcane to do so. Therefore during the entire course of the project, there will be need for practice of good crop husbandry as well as soil fertility maintenance as a vital component of enhancement of agricultural output. Following the provisions in the Act, legally acceptable practices will have to be upheld by all farmers for sustainable production. In so doing, the company will have agricultural officers who will train and sensitize the community in this undertaking.

4.3.9. Plant protection Act CAP 324

It is an act of parliament that encompasses rules for prevention of introduction and spread of pest and diseases destructive to plants. This Act concerns the protection of the health of plants in Kenya. Every occupier or, in the absence of the occupier, every owner of land shall take all such measures as he may be required to take by virtue of any rules made under section 3, and in addition such other measures as are reasonably necessary for the eradication, reduction or prevention of the spread of any pest or disease which an inspector may by notice in writing order.

Relevance

This act will guide the project during sugarcane farming as there will be use of pesticides to control pests in the irrigated fields.

4.3.10. Pest Control Products Act (Cap 346)

This Act of Parliament regulates the importation, exportation, manufacture, distribution and use of products used for the control of pests and of the organic functions of plants and animals and for connected purposes. It also regulates against use of pest control products without due analysis from a certified analyst and inspection from an appointed inspector, in addition to granting due guidance on the licensing of use and storage of the said products.

Relevance

This act will guide the project during farming as there will be use of pesticides to control pests in the sugarcane farms. The act will guide the farmers and extension officers in selection and advising on the right pesticides for use.

4.3.11. Penal Code, Cap. 63

Section 191–Fouling Water: The management shall ensure that no foul water of any public spring or reservoir is rendered unfit for the purpose for which it was ordinarily used for by the community.

Section 192–Dwellings and Neighbourhood: The operation phases of the project shall ensure that health of persons in general dwellings or carrying on business in the neighbourhood or passing along a public facility are protected

4.3.12. Energy Act of 2019

This is an Act of Parliament passed to sought to consolidate the laws relating to energy, to provide for National and County Government functions in relation to energy, to provide for the establishment, powers and functions of the energy sector entities; promotion of renewable energy; exploration, recovery and commercial utilization of geothermal energy; regulation of midstream and downstream petroleum and coal activities; regulation, production, supply and use of electricity and other energy forms; Enforcement and review environmental, health, safety and quality standards. Need to promote environmental protection and compliance with environmental, health and safety requirements. Construction permit request to be accompanied by ESIA Study Report .

Relevance

This project will be generating power and therefore Licensing and authorization to generate electrical power will be as per this Act.

4.3.13. Physical Planning Act 2019,

The 2019 Planning Act govern matters relating to planning, use, regulation and development of land in Kenya. It provides for:

- The government, at both national and county level, is tasked with the preparation of physical and land use plans. The national, county, inter-county and local plans are required to be integrated, and these plans shall collectively form the basis of how land is to be used in Kenya. The Act lists developments that require development permission. In this regard, developments such as subdivision, amalgamation, change of user, extension of user, extension of lease and approval of building plans require development permission to be issued by the relevant county government.
- County governments to control development in their respective counties and therefore all applications for development permission shall be made in the relevant county.
- Development permission must be sought prior to undertaking any development. A developer who does not obtain such prior permission risks criminal sanctions and demolition of the unapproved works.
- Members of the public are given the opportunity to give their views and raise objections to various matters e.g. the suitability of the national and county plans.
- Development permission in respect of commercial and industrial use is a pre-requisite for other licensing authorities granting a license for a commercial or industrial use, or occupation of land.

Relevance

The main purpose of the physical planning legislation is to control the use of land, which is of great importance since it affects the environment. When an owner seeks to develop a plot of land, which is within the jurisdiction of a county government, approval from the Director of Physical Planning is mandatory. The land use of the project area is zoned as agricultural and hence the proponent will be required to do a change of user report.

4.4. INSTITUTIONAL AND ADMINISTRATIVE FRAMEWORK

There are many organizations involved in environmental management in the country. These organizations include the Ministry of Environment and Mineral Resources, National Environment and Management Authority, Local Authorities, Ministry of Water and Irrigation etc.

4.4.1. National Environment Management Authority (NEMA)

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

4.4.1.1. Public Complaints Committee

The Committee performs the following functions

- Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Council;
- Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under Section 9 (3); and
- To perform such other functions and excise such powers as may be assigned to it by the Council.

4.4.1.2. Standards and Enforcement Review Committee

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

4.4.1.3. National Environmental Tribunal

This tribunal guides the handling of cases related to environmental offences in the Republic of Kenya.

4.4.1.4. National Environment Council (NEC)

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

4.4.2. The Agriculture and Food Authority (AFA)

The Agriculture and Food Authority (AFA) is a State Corporation in the Ministry of Agriculture, Livestock, Fisheries and Cooperatives mandated to regulate, develop and promote scheduled crops value chains for increased economic growth in Kenya, The Authority replaced the following institutions:

- Kenya Coconut Development Authority;
- Coffee Board of Kenya;
- Cotton Development Authority;

- Horticultural Crops Development Authority;
- Kenya Sisal Board;
- Kenya Sugar Board;
- Pyrethrum Board of Kenya;
- Tea Board of Kenya.

In consultation with the county governments, the functions of the Agriculture and Food Authority in Kenya are as follows—

- administer the Crops Act, following the provisions of these Acts;
- regulate and promote best practices the production, processing, marketing, grading, storage, collection, transportation and warehousing of agricultural products excluding livestock products as may be provided for under the Crops Act;
- collect and collate data, maintain a database on agricultural products excluding livestock products, documents and monitor agriculture through registration of players as provided for in the Crops Act;
- be in charge of selecting research priorities and providing general advice on research on agriculture;
- advise the national government and the county governments on agricultural levies for purposes of planning, enhancing harmony and equity in the sector;
- Carry out such other functions as may be assigned to it by the Agriculture and Food Authority Act, the Crops Act, and any written law while respecting the roles of the two levels of governments.

4.5. INTERNATIONAL CONVENTIONS AND TREATIES

Kenya has ratified the following Project-relevant international conventions:

4.5.1 Millennium Development Goals (MDGs) and Targets

The Kenya Government subscribes to the following MDGs and targets among others:

- Eradicate Poverty and Hunger by 2015. The Government intends to halve the proportion of people living on less than a dollar a day and those who suffer from hunger.
- Reduce child mortality. As target for 2015, the government intends to reduce by two-thirds the mortality rate among children under five.
- Improve maternal health. A target for 2015, aimed at reducing by two-thirds the ratio of women dying in childbirth.
- Combat HIV/AIDS, malaria and other diseases. A target for 2015 that will bring to a halt and begin to reverse the spread of HIV/AIDS and the incidence of malaria and other major diseases.
- Ensure environmental sustainability.

4.5.2 United Nations Framework Convention on Climate Change (UNFCCC)

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention enjoys near universal membership, with 191 countries having ratified.

Under the Convention, governments:

- gather and share information on greenhouse gas emissions, national policies and best practices;
- launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and
- Cooperate in preparing for adaptation to the impacts of climate change. The Convention entered into force on 21st March 1994.

The landmark UNFCCC was opened for signature at the 1992 United Nations Conference on Environment and Development (UNCED) Conference in Rio de Janeiro (known by its popular title, the Earth Summit). On June 12th 1992, 154 nations signed the UNFCCC that upon ratification committed signatories' governments to a voluntary "non-binding aim" to reduce atmospheric concentrations of greenhouse gases with the goal of "preventing dangerous anthropogenic interference with Earth's climate system." These actions were aimed primarily at industrialized countries, with the intention of stabilizing their emissions of greenhouse gases at 1990 levels by the year 2000; and other responsibilities would be incumbent upon all UNFCCC parties. The parties agreed in general that they would recognize "common but differentiated responsibilities," with greater responsibility for reducing greenhouse gas emissions in the near term on the part of developed/industrialized countries, which were listed and identified in Annex I of the UNFCCC and thereafter referred to as "Annex I" countries. Kenya signed the UNFCCC on 12th July 1992, ratified it on 30th August 1994 and started enforcing it on 28th November 1994.

4.5.3 Kyoto Protocol

According to a press release from the United Nations Environment Programme:

"The Kyoto Protocol is an agreement under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that would be expected by 2010 without the Protocol, this target represents a 29% cut). The goal is to lower overall emissions of six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, HFCs, and PFCs calculated as an average over the five-year period of 2008.

Kenya's accession was presented on 25th February 2005 and the Protocol acceded on 26th May 2005.

Table 3: Plan for compliance with environmental legislation and regulations

Project Phase	Activity	Aspect	Relevant statutes/regulations	Proposed compliance
Planning and design phase	Drawings and Submission of Plans	Approval from Director of Planning from the County Government	Physical and Land Use Planning Act, 2019	The Proponent needs to submit architectural drawings and plans for the proposed Project to the Director of Planning for approval
	Seeking Environmental Impact AssessmentLicense	Approval from NEMA	EMCA, 1999 cap 387 Environmental (Impact Assessment and Audit) Regulations, 2003	The Proponent has Contracted NEMA Registered Environmental Lead Expert in Environmental Impact Assessment/Audit to carryout Environmental Impact Assessment of the proposed Project, prepare a Study Report and submit to NEMA for approval.
Construction Phase	Installation of a Project Signboard	Indicating details of the Developers, Contractors, Project Consultants etc	M.O.W. and NCA Standards	The Proponent will install a Project signboard as per the M.O.W/NCA Standards, approved by NCA
	Site excavation	Vibration due to construction Activities	Regulation 14 and 15 of the EMC (Noise and Excessive Vibration Pollution) Control) Regulations, 2009	The Proponent will ensure that the Contractor complies with the permissible vibration during construction as per the Regulations
	Site Excavation	Dust Pollution	Section 163 of the Local Government Act (Cap 265) Section 175 of the Penal Code (Cap 63)	The Proponent will ensure that the Contractor controls dust as appropriate (See Chapter 8 of this Study Report for details of the proposed dust pollution control).
Construction Phase	Site Excavation	Noise Pollution	Section 102 of EMCA, 1999, Section 89 (3) of the Occupational Safetyand Health Act, 2007, Section 115 of the Public Health Act (Cap242) Environmental management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009	Proponent will ensure that the Contractor: ▪ Complies with the permissible noise levels; ▪ Provide ear masks for use by workers;

Project Phase	**Activity**	**Aspect**	**Relevant statutes/regulations**	**Proposed compliance**
Construction Phase	Transportation and Construction Activities	Emissions	Section 89 (1) (2) of the Occupational Safety and Health Act, 2007, Section 163 of the Local Government Act (Cap 265), Section 118 of the Public Health Act (Cap 242), Section 175 of the Penal Code (Cap 63), Fossil Fuel Emission Control Regulations, 2006, Environmental Management and Coordination (Air Quality) Regulations, 2014	The Proponent will ensure that • Contractor provides respirators for use by workers. • Vehicle driver limit generation of dust • Dust will be suppressed by watering
Construction Phase	Construction at High Level	Accidental Fall	Section 77 (7) of the Occupational Safety and Health Act, 2007	Contractor will ensure that safety harnesses and Scaffoldings are provided to workers.
Construction Phase	Ditto	Falling Objects from High Level	Section 77(7) of the Occupational Safety and Health Act, 2007 Section 101 (1) of the Occupational Safety and Health Act, 2007	Contractor will ensure that helmets are provided to workers and visitors.
Construction Phase	Construction Activity	Sewage Disposal	Section 116 of the Public Health Act (Cap 242) Regulation 13 of the Environmental Management and Co-ordination (Water Quality) Regulations, 2006 Rule 82 of the Water Resource Management Rules, 2007 Section 194 of the Building Code, 1968 Section 176 of the Local Government Act (Cap 265) Section 94 of the Water Act, 2002 Section 52 of the Occupational Safety and Health Act, 2007	Contractor shall ensure that adequate temporary sanitation facilities are provided for workers and visitors to the site.

Project Phase	**Activity**	**Aspect**	**Relevant statutes/regulations**	**Proposed compliance**
Construction Phase	Service of Construction Equipment	Disposal of Waste Oil with Potential to Contaminate both Surface and Ground Water.	Section 94 of the Water Act 2002 Regulations 13 and 18 of Environmental Management and Coordination (Waste Management) Regulations, 2006	The Contractor will adhere to spill control procedures when handling waste oil, identify a licensed contractor to collect waste oil for recycling and label waste oil drums.
Construction Phase	Generation of Debris and Excavated Materials	Disposal of Debris and Excavated Materials	Section 116 of the Public Health Act (Cap 242) Regulation 6 and 7 of Environmental Management and Coordination (Waste Management) Regulations, 2006	The Proponent will ensure that the Contractor through a registered Waste Management Firm dispose the construction waste at the approved disposal site for the construction of the proposed project.
Operation Phase	Obtaining Occupation Certificate beforeOccupation	Occupation Certificate	County government laws	The Proponent will make sure that the Occupation Certificate is obtained once the construction iscomplete and before the facility is occupied.
Operation Phase	Waste oils, fecal waste Disposal	Waste oils and Faecal Waste Disposal	S Regulation 6 and 7 of Environmental Management and Coordination (Waste Management) Regulations, 2006; Water Act, 2016	The Proponent shall use the effluent treatment plant as approved by the relevant authority
Operation Phase	Generation of Solid Waste	Disposal of Solid Waste	Section 116 of the Public Health Act (Cap 242), Regulation 6 and 7 of Environmental Management and Coordination (Waste Management) Regulations, 2006	The Proponent will provide protected/covered dustbin cubicles for collection of scrap metal and other wastes. A Private Waste Management Firm will be contracted to collect, transfer and dispose the solid waste to a licensed waste disposal site.
Operation Phase	Environmental Compliance	Environmental Audits	Section 68 (3) of the EMCA, 1999 , Environmental (Impact Assessment and Audit) Regulations, 2003	Proponent will submit an environmental audit report in the first year of occupation to confirm the efficacy and adequacy of the environmental management plan and to ensure compliance with NEMA's improvement orders throughout the project cycle.

CHAPTER 5
PUBLIC PARTICIPATION AND STAKEHOLDERS ENGAGEMENT

5.1. Introduction

The Kenya government has enshrined the need for human societies' involvement in project development in the Constitution. This has been set out in the EMCA, 1999 and Environmental (Impact Assessment and Audit) Regulations, 2003. Community consultation and participation ensures that communities and stakeholders are part and parcel of the proposed developments and in so doing assures the sustainable use of resources. It has also demonstrated successfully that projects that go through this process will acquire high level of acceptance and accrue benefits to a wider section of the society. Public consultations form a useful component for gathering, understanding and establishing likely impacts of projects determining community and individual preferences and selecting alternatives. Furthermore, through public participation, it is possible to enhance project designs and ensure sustainability of the projects.

5.2. Objectives

The main objectives of the public consultation process were as follows to:

i. Inform the neighbouring community and stakeholders about the proposedProject;
ii. Collect views on the positive and negative impacts anticipated by the neighbouring community/stakeholders and how these can be overcome.
iii. To know the preference of the community in regards to the project; and
iv. To know the community opinion on the proposed project

5.3. Approach

Public consultation, participation and stakeholders engagement for this proposed Project was conducted in the month of July 2022 between the dates of 4th and 21st. this was done through office consultation, holding meetings and administering of questionnaires.

5.3.1. Office consultations

Office consultation took place as follows:

i). Chiefs; Moyoi and Masurura Locations

This took place on 4th where the consultant team together with the proponent visited the area chiefs; Moyoi and Masurura Locations for the introductory meeting. The two locations are important in this exercise because the project site is in Moyoi Location at a site that neighbours / borders Masurura Location. Moreover, most sugarcane farmers are in Masurura Location. The meeting was to disclose the project to the local administration and to ask for assistance in organizing the community for a public participation baraza.

The discussions were fruitful and the two chiefs were in the support of the project. They mentioned that the communities who have firmed sugarcane have been facing problems because the sugar factories in the area; Transmara Sugar and Ndhiwa factories take long; up to 48 months before harvesting their sugar cane. This has resulted to their sugarcane becoming valueless, wastage of land and also resulting to a thriving poverty. They mentioned that if this proposed Sukari industries sugar factory can be brought in this area, it will help a lot as farmer's will now be closer to the factory hence their sugarcane will be harvested on time. This was echoed by the proponent representative who assured that the delay that normally happens is because of the long distance to the factories and with the huge clientele, those who are far are normally given last priority hence ones the factory is situated in this area, there will be no more delays and the sugarcane will be harvested on time.

The area chief; Moyoi Location mentioned that, there is a coffee factory in his location that he participated in its establishment including the community involvement and therefore he understands well the need of public participation on projects. They noted that the project will amongst many benefits create employments, improve living standards and also reduce cattle rustling.

The two chiefs agreed to assist in the organizing the public baraza but that the area ACC must be notified first. So we were then directed to pay a courtesy call the area ACC.

ii). Assistant county commissioner

This took place on 5th July, 2022 where the consultant team together with the proponent visited the area Assistant County Commissioner (ACC) who by then was also the acting Deputy County Commissioner (DCC). The meeting was to inform him on the proposed Sukari industries sugar factory project, to request his assistance in bringing the two locations to organizing a joint public participation baraza and also to request his assistance in organizing a stakeholder's engagement meeting.

The meeting was fruitful as he supported the project and noted that the factory will:-

a) Create employment hence those youths that have no jobs will now be employed,
b) Cases of cattle rustling will reduce because those engaged in cattle rustling will now be engaged in employment at the factory while some will be busy in their sugarcane farms.
c) Cases on delayed sugarcane harvesting will be a story of the past as the factory will be closer to them,
d) Create competition amongst the sugar companies in the region hence good cane prices and services to farmers;
e) Improve on the land use as most land are left fallow.

He suggested that it is important for the Sub-county security committee to be informed of the project so that the committee can give its view or concerns on the project in relation to security and the wellbeing of the community. A meeting with the security team was then scheduled for 8th July, 2022 while the community public participation baraza to be on 12th July, 2022.

5.3.2. Meetings

i). A meeting with the Sub County security committee

A meeting with the security team was held on 8th July, 2022 at the DCC boardroom and was attended by the ACC acting DCC and also chairing the meeting, committee secretary, area OCPD, area DCI, area CIPU, committee secretary, project consultant of proponent representative.

Issues discussed were on the land ownership issues and security in regard to the proposed project area. The consultant and the proponent representative informed the meeting on the proposed project; the proponent, location of the project, the rationale of the project, anticipated factory TCD and the support the company needs from the security committee. On the other hand, the security committee wanted to know the land ownership details, when it was acquired and from who, if the demarcation and fencing had already been done and if since then the proponent had received any complain or repulsion from the community.

The committee informed that, the project area has always experienced land clashes due to land ownership and use disputes hence there is a caveat on any dealing on land; fencing, demarcation, beaconing or transfer of land (title deed) until the elections are concluded.

They however, they noted that they have not heard any dispute over the project land though they emphasized that since fencing of the site (land) has not been done, the proponent to wait until end of the election. The committee was also informed of the intended public participation and stakeholders' engagement meetings. It was recommended that the police be informed, relevant police permitted be acquired and also the police to provide necessary security during the public participation baraza / meeting.

The committee had no objection to the project as they welcomed it noting that it will make youths busy and engaged hence they will not be involved in misconduct and crime, vices that normally results to insecurity issue.

ii). Community / public bazara / meeting

The public baraza was held on 12th July, 2022 at Loliondo Shopping Centre with participants from the two locations; Moyoi and Masurura. The meeting was also attended by Area Assistant County Commissioner (ACC), Police (Critical Infrastructure Protection Unit), District Officer, Area Officer Commanding Station (OCS), a Representatives from the Area Security Committee, chiefs and their assistants, village Elders, Mr. Moses Apunda & Mr. John Okinda as representative of the Proponent and the consultant team.

The area chief informed the meeting that there are investors (Sukari Industries LTD) who are planning to put up a sugar processing plant in the area and as per the government requirement on public participation, the project is being subjected to public participation exercise hence the meeting.

The community was therefore given a brief on the project, location of the project, project scope of operation, the benefits the community will get as a result of the factory being situated in the area.

First the community leaders in the meeting were given a chance to give a word on the project. In so doing all were in agreement that the project is good for it is a great opportunity for the locals to engage in an alternative economic activity apart from pastoralism, the project will employ many people including youths hence will put an end to cattle theft which is common in the area, will boost the economy and security in the area, hence supporting the project is creating a secure future for their children. They all were in support of the project and they urged the community to critic the project with an aim of ensuring the project is implemented and will operate in an environmentally friendly manner and in a way both the proponent and community will positively benefit.

During open discussion, the community got a chance to critic the project by asking questions and clarification on the project. Issues they raised included:- how sugarcane will be harvested and transported from the farm to the factory yet the roads are bad while in some areas there are no roads, how the company will convince the community to abandon pastoralism and embark on sugarcane farming, what the company will do to the community as part of CSR, if there are sugarcane varieties that mature faster (earlier than the normal 18 months), if the sugarcane will take several months on the farm without harvesting as it is currently experienced, how the company will assist the community to grow sugarcane, if the company will offer job opportunities to the locals, the price the company will offer to the community per ton of sugarcane, if the company will be able to hire there land for sugarcane growing, if a farmer can register his cane with different companies, how the company will handle environmental issues for the project is located near two rivers.

All these concerns were all responded to satisfactorily and the community was convinced that the proposed project is a good development that is coming their way.

All these concerns were all responded to satisfactorily and the community was convinced that the proposed project is a good development that is coming their way. In response to the above issues, they were informed that:-

- ✓ The factory in liaison with road department will open and maintain the roads that connects to farms to enable easy access to the farms by way of farm machineries,
- ✓ The company will have agricultural officers and supervisor to train and sensitize the community on the benefit of engaging on sugarcane farming and how they can simultaneously practice farming and pastoralism
- ✓ The company will liaise with the area local leaders to form a committee that will be handling the CSR projects which ranges from roads, hospitals, water projects, bursaries, scholarships, management trainings and any other project that will be determined by the committee and as per the capability of the company
- ✓ The company is working on a research to have cane variety that can mature in 12 months hence can be harvested 4 times
- ✓ Sugarcane will not take long on farm because the factory will now be closer to them and the company also has a system that monitor cane development for all its registered farmers and therefore a famer will be informed promptly on the due date of harvesting hence there will be no delay or cane overstaying on farm
- ✓ The company will have agricultural extension officer who will be with farmers throughout training them on how to plant sugarcane, the best variety, how to intercrop. The company will also give financial advances to aid the farmer in preparation of the farm and for farm inputs at subsided cost which will be charged at 6% rate
- ✓ The company will follow government guidelines on employment hence it will give first priority to locals during employment
- ✓ Sugarcane price varies but currently it is about 4200/= per tone
- ✓ Yes, the company is in a position to hire farm from the community though they encourage registering with them then they help financially to develop the cane farm
- ✓ A famer can only register with one sugar factory and therefore a company cannot harvest sugarcane that was registered by another company because this will bring conflict between the two companies of cane poaching
- ✓ The company is undertaking environmental impact assessment hence the recommendations of the report will be complied with throughout the project phases

- ✓ The company will hire environment officer to oversee implementation of the report,
- ✓ The company will liaise with local tree nursery owners to distribute to farmer seedling to plant in their farms as they shall have been trained to plant
- ✓ The company will plant tree along the river bank to be a buffer zone,
- ✓ waste water will be well managed not to cause any pollution;
- ✓ Air pollution will be well controlled / avoided by use of Electrostatic precipitator system in their chimney.

By the end of the discussion, it was realized that the community and the administration do welcome the project with no objection. However, it was on condition that all their concerns and requests are well taken care of. The proponent agreed to the requests and also requested that the community to welcome the company as one of their own because they will work, live and associate with them as one family. They were also informed that in case of any problem, the grievances to be channeled to the right authority instead of demonstration i.e., consulting with the proponent, area chiefs, NEMA and other Authorities in that order as it will be necessary.

Plate 2a & b: Public participation meeting

iii). Stakeholders' engagement meeting

The meeting was held on 21st/07/2022 with the attendance from all government offices at national and county levels.

Mr. Baya; area ACC and DCC while chairing the meeting informed that there are investors (Sukari Industries LTD) who are planning to put up a sugar processing plant in Moyoi location and as a requirement of the Environmental Impact Assessment process they called for the stakeholder engagement meeting having conducted a community participation meeting. He then invited the proponent Sukari industry and Consultant for further clarification about the proposed project.

Addressing the meeting, Mr. Kibathi (consultant) informed the meeting that the meeting of the day was called for two purposes; (i) to inform the project stakeholders about the project and (ii) accomplish the requirement of EMCA cap 387 and EIA / EA regulations of 2003 that all projects such as the proposed one be subjected to Environmental Impact Assessment process.

He informed that a public / community participation meeting / Baraza was held the previous week date 12th July, 2022 hence this stakeholders engagement meeting. He then introduced the representatives from the Sukari Industries Limited to give a brief on the proposed project as they were the proponents.

Mr. Moses Apunda and Mr. Maharajan took the meeting through factory operations and benefits. Mr. Apunda introduced the company stating that, Sukari Industries is a factory that deals in sugarcane processing and selling the sugar in the local market. He continued that Sukari industry under the Rai group also has other sugar processing factories in Ndhiwa and Kakamega. He continued to inform that the company saw the need to introduce the project in the area because (i) the land in the area is fertile and fit for sugarcane farming and (ii) sugarcane farmers in the area face difficulties transporting their sugarcane to the factories as they are far and it would be better to have one closer to them. He later on enlightened the meeting on the project component activities, operations and benefits of the company to the community.

Mr. Maharajan the company's agriculture manager enlightened the meeting on the agricultural productions and benefits that farmers will enjoy. He stated that the factory is good as it will boost growth of trading Centre in the area in terms of economy, infrastructure and security. Many farmers who will be involved in the both directly and indirectly will have their living standards boosted. He gave an example of how Riat and Ndhiwa shopping Centres were before Sukari sugar factory in Ndhiwa came into being and where the centres are currently. (*Refer to the minutes annexed).*

He then emphasized to the stakeholders who were present in the meeting to support the project to enable the community enjoy all the benefits associated with the project. He concluded by noting that sugarcane farming is actually a safer economic activity compared to gold mining which is very risky and dominant in the area.

This was seconded by the ACC Mr. Baya who reinforced and clarified on the much benefits the company would bring forth to the community.

Stakeholders were then given the opportunity to raise their concerns, give their opinions, ask questions, clarification or give a recommendation. It was then commented as follows:-

i. It was noted that the area is dominated with indigenous trees and therefore KFS officer requested to be engaged before clearing trees for construction works;
ii. The company to sensitize farmers not to clear all trees to cultivate sugarcane as most of the trees are used for medicinal purposes, fodder for the livestock and they are also

necessary for environmental conservation. It is a requirement that every farm must have at least 10% tree cover.

iii. The company to have a tree nursery and also to partner with the local tree seedling producers to give farmers trees to plant on their farms. Trees must be those that survives and grown in the area

iv. The Effluent treatment Plant be constructed during construction phase not when the factory is already operating. This was experienced in another factory so this should not happen with this factory.

v. The factory to prepare for disasters like fire outbreak and put adequate measures, firefighting equipment and engage county fire fighting department incase of such disasters.

vi. Urged the company to plant trees along the river banks to act as buffer zone.

vii. Urged the consultant to prepare a standard EIA report that will mitigate all the negative impacts and that the proponent (the company) to ensure that the recommendation of the report are implemented to avoid environmental disturbance and conflict that may arise from the community and various legislation enforcers due to noncompliance.

Plate 3: stakeholders' engagement meeting

Plate 4: proponent representative addressing the stakeholders meeting

Plate 5: ACC and also Acting DCC Mr. Baya addressing the stakeholders meeting

Questions / issues that arose and their response were as outlined in the table below:

Table 4: issues and response during stakeholders engagement meeting

	Questions/ issues raised	**Answers / response**
1	What will be the source of water that will be used in the company operations	The company will source water from the neighbouring River Migori but after undertaking required assessment and permit issued by Water Resource Authority (WRA)
2	How will the company partner and collaborate with other government agencies	Each government office at the national and county level has a defined role and therefore the company will ensure that it liaise with all the relevant government agencies both at the national and county levels to ensure that their operations are in tandem with the laid down legislations. The company will also collaborate with various office as need may arise to implement various projects and activities the company want to undertake. i.e the company will partner with county department of environment and NEMA to commemorate world environment day.
3	How will the company address conflicts that may arise between community and the company and those related with pastoralism and sugarcane farming	The company together with the local leadership will form a grievance redress mechanism to address issues that may arise. These may include conflict between community on pastoralist and sugarcane farming and also conflicts that may arise between the community and the factory.
4	What measures will the company put in place to ensure occupation, health and safety of its employees	• Company will employ occupation, health and health officers who will ensure that the EMP is implemented • Workers will be provided with protective gears • Company will construct houses with sewer systems for accommodation of some employees • Company will give health insurance to its employees
5	How will pastoralist benefit from cane farming	Company will train famers/community to make use of the sugarcane leaves after harvesting a feed for their animals and to embrace molasses as nutrient additive to livestock feed to improve on their livestock yield.

	Questions/ issues raised	**Answers / response**
6	Will the company keep to their promise on the CSR or it will short change community as they have experienced with other companies? (expectation verses reality)	The company promised to have good relationship with the community and to ensure that their promises to the community are implemented through the CSR. There will be a committee that will be formed between the company and the community to deliberate and decide on what project they will implement as CSR
7	If the company will provide means for cultivation	The company will have farmers-company agreement programme that will cater for cultivation, seedlings, weeding and harvesting mechanism at subsidized cost.
8	How will the company control air and environment pollution	**During the construction** • The company through the contracted contractor will ensure that the roads used in collection / sourcing of materials are sprinkled with water to suppress dust. At the site the same will be done. **During operation** • Company will use Green Energy System to ensure minimum waste production • Bagasse will be recycled to produce energy • Effluent treatment plant will be constructed • Testing and treatment of waste will be done as per NEMA standards • Plant trees around the factory to absorb carbon dioxide • Electrostatic precipitator system will be applied to avoid air pollution • Company will employ an environment officer who will ensure that the recommendations of the EIA report are implemented appropriately
9	How will the company ensure there will be no food insecurity as a result of using much of their land to farm sugarcane	Sugarcane can be intercropped with other subsistence crops and therefore the company will have field officers who will be with farmers throughout training them on intercropping methods, the best sugarcane variety to plant to ensure proper intercropping, and how to ensure pastoralism also benefit from sugarcane farming.

	Questions/ issues raised	**Answers / response**
10	Most towns in sugarcane belt / where tractors transporting sugarcane to the factory use are always littered with sugarcane. How will the company l ensure that its area of operation and nearby are free from this waste nuisance	The company through their harvesting supervisors will ensure that canes are tightly loaded to avoid scatter or dropping when on transit. Additionally the company will designate a vehicle that will be going round collecting the dropped sugarcane. The company will also partner with county government department in charge of waste management to organize periodic cleanup activities to clean the wastes.
11	Opening roads to access cane farms and to transport cane to the factory may lead to generation of dust that may be of health risk to the community. So how will the company prevent or minimize this dust? Will roads be tarmacked	Dust is cost by high speed moving vehicles and therefore the company will put in place speed regulators that drivers will have to adhere to failure to he or she shall be answerable. Tarmacking will prove expensive to the company.
12	How the company is planning to address the issues of delay in harvest of sugarcane and payment	The delay in harvesting currently being experienced in the area is because the factories servicing the area are far hence it takes time. By constructing the company at the proposed location, the factory will be close to farmer hence canes will be harvested in time. The company also has a system that monitor cane development for all its registered farmers and therefore a famer will be informed promptly on the due date of harvesting hence there will be no delay or cane overstaying on farm. Due to corona the cane are currently harvested at 24 months but with this new factory canes will be harvested in 18 months. The company is also doing its research to ensure that they have a cane that mature in 12months. Farmers will be paid after two weeks from the day of harvest. Payment will be done every Thursday of the week
13	If the company will give farmers seed canes and fertilizers for farmers	The company will give GMO seed canes that will mature faster and fertilizers at subsided cost which will be charged at 6% rate

	Questions/ issues raised	**Answers / response**
14	The company representatives explained to the meeting on how well they management environment in other factories that they also manage meaning they will do the same in this proposed factory. The meeting wanted to know if the company can take some community members and stakeholders to see how well they manage those companies so that they are convinced that what they are being told is true before implementation of this project.	The company will pick around 20 individuals and take them to other branches to witness factory operations. ACC recommended that 3 to come from county government, 3 from national government the remaining 14 to come from the two locations each giving 7 people
15	It was noted that in most cases during harvesting and when using the cane loader to load the cane on the tractor, a lot of sugarcane is left not loaded. This disadvantages the farmer because a lot of canes that would have fetched him/her money is left. So how will this be prevented? So how will company ensure that no cane is left on the farm during harvest and loading of sugarcane	• Company will have field officers who will monitor the activities and do follow up. During harvesting, apart from cane loader, the company or the famer shall/should ensure that there are manual loaders who will be collecting the remaining canes and loading them on the tractors while they are still on the farm. • The farmer may also collect the left canes and contact the company to come and pick the left canes.

By the end of the discussion, it was noted that the stakeholders were for the project as they welcomed it with no objection.

5.4. Conclusion

From the public participation and stakeholders engagement exercise conducted and analysis of the questionnaires administered it is concluded that the community, stakeholders and the general public had no objection to the project hence they welcomed it. This was on the condition that the issue raised be adequately addressed and they company keep to its word on CSRs.

CHAPTER 6
ANALYSIS OF PROJECT ALTERNATIVES

6.1. INTRODUCTION

This Chapter analyses the proposed Sugar Factory Project alternatives in terms of site and technology. It describes the relocation alternative, no Project alternative and the proposed development alternative. It also analyses the alternative construction materials and technology.

6.2. PROJECT ALTERNATIVES

6.2.1 Alternative 1: No project alternative

The no project alternative in respect to the proposed Project implies that the status quo is maintained. Under the no project alternative, the existing land use and ecological system will not change. In addition the Proponent's proposal would not receive the necessary approval from NEMA hence will not be constructed. The proposed sugar factory would not be constructed and the expectations attached to the Project would not be met. The no project construction alternative is the least preferred from the socio-economic perspective. This alternative would only be considered if the proposed project have adverse, irreversible and impacts that cannot be mitigated. Assessment of this project states that the impacts that are anticipated from this project can be mitigated. Therefore it is apparent that the "no project alternative" is not a viable alternative to the Proponent.

6.2.2 Alternative 2: Proposed construction alternative

Under the proposed construction alternative, the Proponent would be issued with an EIA License to implement the project. The site was determined by way of land availability, plot size, social surveys and compatibility of the site and the project. The project area is not within any critical ecological ecosystem and not under any dispute. Though it not in character with its surrounding, project consultant has assessed the project and prepared this EIA study report that contains all possible economic, environmental and social impacts with their mitigation measures, hence the project will not affect the surrounding environment and community if all the mitigation measures proposed in this report are ensured. If NEMA is convinced that the site is ecologically and socially ideal for the project and the resulting impacts will adequately be mitigated it will issue the license the project. Due to NEMA approval for construction and operation of the proposed sugar factory, the proponent and the community will enjoy all the benefits associated with the project.

6.2.3 Alternative 3: Relocation alternative

Relocation alternative to a different site is an alternative available for the Project implementation. However, at present, the Proponent has land on the other side of river Steti; not far from the site, however, the parcels are in pieces with other land owners in between hence amalgamating them is a challenge. Therefore the parcels are not verse enough to accommodate the project.

The Proponent has also spent money on the proposed Project site during the planning and design phase. Relocation alternative would mean that the Proponent would have to identify another land and purchase as an alternative site. This will cost theProponent a large sum of money. Whatever has been done and paid to date will be counted as a loss to the Proponent. The proposed Project is also in line with the industrialization and development agenda within the area. In consideration of the above concerns and assessment of the current proposed site, relocation of the proposed sugar factory Project to a different site is not a viable alternative.

6.3. **ANALYSIS OF ALTERNATIVE MATERIALS AND TECHNOLOGY**

The proposed sugar factory will be constructed using modern, locally and internationally accepted materials and technology to achieve public health safety, security and environmental quality requirement. The structures will be made using locally sourced stones, cement, sand, metal bars and fittings that meet the Kenya Bureau of Standards requirements. Heavy use of timber during construction is discouraged. Equipment that saves energy and time will be given first priority.

6.4. DEVELOPMENT ALTERNATIVE

The No Project Alternative option in respect to the proposed project implies that the status quo is maintained. The proponent has no alternative to this project.

6.5. WASTE MANAGEMENT ALTERNATIVES

6.5.1. Solid waste

A lot of Solid waste will be generated from the proposed project that will need proper management. Options to be considered in managing the waste:-

i. Engaging county government (waste management is a devolved function) to be collecting and disposing in their waste disposal site. However, it is noted that Narok county government just like other county government faces huge challenge in waste management including not having a legalized or a designated waste disposal site and therefore this option is not the ideal one as it will not lead to proper management of waste.

ii. Contracting a NEMA licensed waste collector to be collecting wastes from the premise for safe disposal. However, the amount of waste generated by the company is a lot hence

contracting may be expensive. Additionally disposal site would be a problem as the contracted waste collectors are supposed to dispose the waste at a designated waste disposal site that the county doesn't have.

iii. The third option will be the company managing their own waste. This will be through an integrated solid waste management system that covers from generation, to final; disposal on site. This will include having own disposal site. An integrated solid waste management system is recommended for it ensures management of wastes generated in accordance with the Environmental Management and Coordination (Waste Management) Regulation of 2006

6.5.2. Liquid waste

Liquid waste generated will be handled in accordance with the Environmental Management and Coordination (water quality) Regulation of 2006. For the factory processing waste water, lagoons will be constructed for the management. For residential section, the proponent will opt to use bio digesters for the management of waste.

6.5.3. Alternative Bagasse management

Bagasse is the residual material after extraction of juice from sugarcane. The proponent shall have a robust bagasse waste management infrastructure that comprises of briquette processing for the consumption by the local community in order to reduce chances of forming leachate especially during wet weather. Bagasse Leachate is a low pH liquid which normally forms when rain water percolates through bagasse and washes some of the bagasse organic components. The Proponent has considered each of several methods in the management of bagasse.

a. Transfer the bagasse heap to another location

The Proponent explored the possibilities of shifting the bagasse from the factory grounds to another site to reduce the quantities of bagasse at the yard. However this will only worsen the situation since the large quantities of bagasse will form leachate in the near future.

b. Use of bagasse in co-generation of power and steam

The Proponent will use fresh bagasse to produce power at its station. However, the power station will only be able to utilise a fraction of the fresh bagasse daily out of the quantities produced from crushing of cane per day.

c. Reuse of bagasse in making of briquettes

The Proponent has considered introducing making of briquettes at the sugar mill once the mill commences operation. It will involve drying bagasse from 45% - 50% to the required 8% moisture content in order to make the briquettes.

d. Reuse of bagasse as soil conditioner

Bagasse could be a suitable soil conditioner if applied in thin layers and with pH adjustment, for example, using lime. The Proponent shall work with farmers on application of the bagasse on land

6.6. ALTERNATIVE TECHNOLOGIES

The design of the project has taken into account measures that can be implemented to minimise air pollution and wastewater production through recycling, treatment and reuse. No discharge of effluent shall be made to the Migori River before satisfactory treatment. Sewage arising from the workforce at the plant will also be discharged into septic tanks and bio digesters. Equipment for the development was preferred with reference to available capital, function and environmental compliance. The design of the facility and the related equipment were undertaken with a view to providing the most suitable, modern and practical facilities for the expected users while maximizing the need to conserve and protect the environment against pollution and degradation.

6.7. PREFERRED OPTIONS

For this project, there are limited alternatives for the project site because the proponent already operates a sugar plant. Therefore, emphasis is placed on the technological approaches that the proponent will adopt in constructing and managing environment, health and safety of the proposed development

CHAPTER 7

PROJECT POTENTIAL IMPACT SAND MITIGATION MEASURES

7.1. INTRODUCTION

The proposed construction of the proposed sugar processing factory will have both positive and negative environmental and social impacts. Through an intensive and extensive field survey, key stakeholder consultation and public participation forums conducted on the proposed project area, the impacts were identified. Additionally, literature review of published reports and scientific papers on road projects was conducted to provide a complete list of expected impacts on the project.

This Chapter identifies and discusses both positive and negative impacts associated with the proposed project during its construction, operation and decommissioning.

7.2. SOURCES OF IMPACTS

The impacts associated with the proposed project will emanate mainly from *project inputs, activities and outputs*. These will be related to the following activities associated with the proposed project:

i. Sourcing and extracting materials
ii. Transportation of materials to the site
iii. Demolition works
iv. Vegetation clearance
v. Excavation works
vi. Construction activities
vii. Handling of construction wastes
viii. Project operation more so camp site and
ix. Decommissioning activities (camp site)

7.3. RATING

The environmental impact assessment and analysis was done using a number of methods and tools. While identifying impacts, a checklist was used. This indicated all possible impacts that would accrue from implementation of this project. A weighted matrix was used to examine the level of impact for each particular impact.

A significance rating is allocated to each potential impact, based on consideration of the probability, intensity, extent, duration and possible mitigation of the potential impact. These terms are explained as follows:

- ✓ Probability: the likelihood of the impact occurring;
- ✓ Intensity: the „severity" of the impact or extent to which ecological and social processes

are altered;

- ✓ Extent: the scale of the impact on a project area, regional, national level or at international level;
- ✓ Duration: the length of time the impact will last, which may be anything from several days to the entire lifetime of the development; and
- ✓ Mitigation: Ways, in which an impact can be avoided, minimized or managed to reduce its environmental significance.

Each rating is based on observations made during the site visits and on professional judgment. Based on a synthesis of the above criteria, significance of an impact is rated as follows:

- ✓ Very High significance: where the impact would influence the decision to authorize the proposed development with strict mitigation measures to reduce the impacts significantly;
- ✓ High significance: where the impact would influence the decision to authorize the proposed development regardless of any mitigation measures;
- ✓ Medium significance: where the impact should influence the decision to proposed development, and where mitigation measures can, and must, be specified to reduce the overall impact; and
- ✓ Low significance: where the impact would not have any influence on the decision to authorize the proposed development.

The above impacts are being evaluated on their severity using a matrix analysis. The matrix analysis provides a holistic indication of the relationship and interaction between the various activities, development phases and the impact thereof on the environment. The method aims at providing a first order cause and effect relationship between the environment and the proposed activity.

The following describes the phases of the project;

D&P: Design and Planning phase;

C: Construction phase;

O: Operation phase;

D: Decommissioning phase.

Rating of impacts is vital as it helps to provide mitigation measures that are relevant according to how the impacts affect the area locally or internationally. The table below brings out a matrix used during the ESIA study stage in rating impacts. The rating parameters are also described in table;

Table 5*: Impact Matrix Table*

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
				D & P	C	O	D C							
1.	Biodiversity	Loss of habitats	-		x	x		-3	-3	-1	-2	-2	-11	Yes
2		Loss of Aquatic organisms	-		x	x		-3	-3	-3	-1	-4	-14	Yes
3		Loss of vegetation	-		x	x		-3	-3	-1	-1	-4	-12	Yes
4		Occurrence of invasive species	-			x		-4	-3	-2	-3	-3	-15	Yes
5		Increase in Pest and Diseases	-			x		-4	-5	-2	-3	-2	-16	Yes
6.	Soils	Increase in erosion	-		x	x	x	-3	-3	-1	-2	-2	-11	Yes
7		Improved Soil Fertility	+			x		+3	+3	+1	+2	+2	+11	Yes
8		Sedimentation	-		x	x	x	-3	-3	-1	-2	-2	-11	Yes
9		Water logging	-			x		-3	-2	-1	-2	-1	-8	Yes
10		Pollution	-		x	x	x	-3	-3	-1	-2	-2	-11	Yes
11.	Water	Changes in Hydraulics of the river	-			x		-3	-3	-2	-3	-3	-14	Yes
12		Access to water	+			x		+4	+4	+1	+3	+3	+14	No
13		Water loss	-			x		-2	-2	-1	-2	-2	-8	Yes
14		Water quality	-		x	x	x	-3	-3	-2	-2	-2	-12	Yes

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
				D & P	C	O	D C							
15.	Air	Dust pollution	-		x	x	x	-3	-3	-1	-3	-2	-12	Yes
16		Agrochemical pollution	-			x		-3	-3	-1	-2	-2	-11	Yes
17		Greenhouse gases	-			x		-3	-2	-1	-1	-2	-9	Yes
18		Exhaust fumes	-		x	x	x	-2	-2	-1	-1	-1	-7	Yes
19.	Noise	Noise	-		x			-2	-3	-1	-2	-1	-9	Yes
20.	Land	Loss of aesthetic value	-		x			-2	-3	-1	-1	-2	-9	Yes
21		Increase in Land value	+			x		+4	+3	+2	+3	+3	+15	No.
22.	Wetlands	Pollution	-		x	x		-3	-3	-2	-2	-3	-13	Yes
23.	Waste	Gaseous	-		x	x	x	-3	-2	-1	-1	-2	-9	Yes
24		Liquid	-		x	x	x	-3	-2	-1	-1	-2	-9	Yes
25		Solid	-		x	x	x	-3	-2	-1	-1	-2	-9	Yes
26.	Agriculture	Increase in crop yield	+			x		+4	+4	+4	+3	+3	+18	Yes
27		Increase in animal husbandry and	+			x		+4	+3	+1	+2	+2	+11	Yes
28		Overgrazing	-			x		-1	-1	-1	-1	-1	-5	Yes
29		Agro-Industrial growth	+			x		+3	+3	+4	+3	+3	+16	Yes
30.	Conservation	Adoption of Agro forestry	+			x		+4	+4	+4	+3	+3	+18	Yes
31		Catchment management	+			x		+4	+4	+4	+3	+3	+18	Yes
32		Water conservation	+			x		+4	+4	+4	+3	+3	+18	Yes

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
				D & P	C	O	D C							
33	Local Economy	Increase in employment opportunities	+		x	x	x	+5	+4	+4	+3	+3	+18	Yes
34		Improved access to market	+			x		+4	+4	+4	+3	+3	+18	No
35		Increased income	+		x	x		+4	+4	+4	+3	+3	+18	No
36		Reduced poverty Rates	+		x	x		+4	+4	+4	+3	+3	+18	No
37		Availability of financial institutions	+			x		+4	+4	+4	+3	+3	+18	No
38.	Infrastructure	Improved Access Roads	+		x	x		+4	+4	+4	+3	+3	+18	Yes
39		Improved Communication Systems	+			x		+4	+4	+4	+3	+3	+18	Yes
40		Provision of domestic Water facilities	+		x	x		+4	+4	+4	+3	+3	+18	Yes
41	Food	Food security	+			x		+4	+4	+4	+3	+3	+18	No
42.	Health	Occupation Health and safety	-		x	x	x	-4	-4	-2	-3	-3	-16	Yes
43	Human wildlife conflicts	Severance of wildlife and livestock movement routes	-			x		-1	-2	-1	-1	-2	-7	Yes
44	Disruption	Social disruption	-		x	x	x	-2	-2	-1	-2	-3	-10	Yes
45		Land Conflicts	-		x	x	x	-2	-2	-1	-1	-1	-7	Yes

No.	Environmental Aspects	Description	Nature / Direction of Impact	Phase of the project				Significance	Probability of Occurrence	Scale /Area of Impact	Magnitude	Duration of Occurrence	Average Score	Mitigation Needed
				D & P	C	O	D C							
46	Contractors camps	Increase in waste generation	-		x			-4	-4	-2	-3	-3	-16	Yes
47		Occurrence of spillage	-		x			-4	-2	-1	-3	-3	-13	Yes
48		Occurrence of accidents	-		x			-4	-4	-2	-3	-3	-16	Yes
49	Cultural heritage	Changes in Behaviour and local culture	-		x	x		-2	-1	-1	-1	-2	-7	Yes
50	Gender	Child Labour	-		x	x	x	-2	-2	-1	-1	-2	-8	Yes

The figures in the table above can be justified basing on the impact rating parameters shown in the table below.

Table 6-2 *: The Impact rating parameters*

Score	1 (- or +)	2 (- or +)	3 (- or +)	4 (- or +)	Assumptions
Significance	Low	Medium	High	Very High	
Probability of Occurrence	Low	Medium	High	Very likely	
Scale/area of impact	Project area	Regional	National	International	
Magnitude /Intensity	Low	Medium	High	Very High	
Duration of Occurrence	Short term	Medium term	Long term	Permanent	

7.4. IMPACTS AND MITIGATION MEASURES

7.4.1. PRE-CONSTRUCTION PHASE

7.4.1.1. Positive impacts

- ✓ **Gaining Knowledge**

Farmers will be educated and given awareness on sugarcane growing and farming during Pre-construction phase hence will gain knowledge

7.4.2. CONSTRUCTION PHASE

7.4.2.1. **Positive impacts during construction phase**

A number of positive impacts are associated with the proposed Sugar factory during its construction phase. These are as discussed below.

i. ***Employment opportunities***

The proposed Project will directly and indirectly create employment for a number of workers both unskilled and skilled workers. However, the exact number cannot be predetermined at this stage. These are people will work at the site and those who will be employed by entities / businesses that will be related to the construction of the project. This is also the phase where the company will be sensitizing the community to plant sugarcane and therefore a number of agricultural extension officers will also be employed.

Though the employment will be temporary, those who will be employed will earn income hence use the money to satisfy some of their needs.

ii. ***Provision of market for supply of building materials***

The Project will require supply of large quantities of building materials most of which will be sourced locally in Narok and in the surrounding areas. Producers and suppliers of materials such as building stones, timber, electrical cables, paint, sand, and cement will thus get market for their goods. This provides ready market for building material suppliers such as quarrying companies, hardware shops and individuals with such materials. However, the hard rocks that will be excavated from the site during construction will also be reused.

iii. ***Provision of market for food vendors and owners of nearby business premises***

The construction workers will attract food vendors in the area to supply food to the construction workers. The food vendors will therefore increase their sales and income as a result of selling food to the construction workers. In addition, the owners of the nearby business premises are also likely to benefit as a result of the construction workers purchasing some of the items from their shops.

iv. Opportunities for skill acquisition

With generally young population of between 19-55 and many of them with primary and above qualification, the project will provide a good opportunity for skill acquisition. They will acquire skills which will be vital for them to work in other similar projects in future.

v. Gains in the local and national economy

The construction stage will bring a need to for goods and services that will be sourced through purchases. Construction materials such as sand, ballast, rocks, cement, metal, fuel and among others will be sourced from various parts of the county. The consumption of these materials will attract taxes which will be payable to the government.

7.4.2.2. Negative impacts during construction phase

The following negative impacts are also associated with the construction of the proposed Project.

i. Environmental Degradation as a result of material sourcing (extraction)

Impacts related to the construction material sites such as gravel sites, sand harvesting sites and quarry sites include clearance of vegetation, landscape scars, dust and general disturbance during excavation and the need to reinstate or landscape the gravel sites when the contractors have completed excavation works.

Material sites if not reinstated and rehabilitated after project completion, will create a badlands type of landscape with water bodies, pools of water, scattered boulders and rubble of ballast on the soil surface.

Unfenced quarry and burrow pits sites full of water will be risky to public especially children; livestock and wildlife due to drowning associated deaths, therefore should be fenced off when in use;

Mitigation

- Aggregates will be sourced locally from NEMA approved sites and burrow pits in the project area;
- Burrow pits and quarries shall be located more than 50 meters from watercourses.
- Cordon / fence off the gravel site areas to keep livestock and children off;
- Prepare and implement burrow pit rehabilitation plans, which would minimise the risk of erosion;
- The use of burrow pits for material spoil sites must be approved by NEMA and with the appropriate consent of the "landowner".
- The contractor is expected to follow the sand harvesting regulations published by NEMA;

In case of blasting:

- Contractor will be responsible for obtaining a current and valid blasting authorization from the Department of Mines and Geology prior to any blasting activity.
- A qualified and registered blaster by the shall supervise all blasting activities
- Contractor shall ensure that appropriate pre blast monitoring records are in place (i.e. photographic and inspection records of structures in close proximity to the blast area);
- The Contractor shall ensure that emergency services are notified, in writing, a minimum of 24 hours prior to any blasting activities commencing on Site;
- The Contractor shall take necessary precautions to prevent damage to special features and the general environment, which includes the removal of fly-rock. Environmental damage caused by blasting/drilling shall be repaired at the Contractor's expense to the satisfaction of the affected person / entity;
- Contractor shall ensure that adequate warning is provided to the local communities immediately prior to blasting. All signals shall also be clearly given;
- The Contractor shall use blast mats for cover material during blasting. Topsoil shall not be used as blast cover

ii. *Local increase of construction traffic*

Construction of the proposed Project will make local increase of construction traffic inevitable though it will not be significant enough to cause traffic jam along Kehancha – Lolgorian Road because the road in currently not heavily used. The increase will be as a result of the movement of the construction vehicles and machines in and out of the construction site. Though may not be of much significance, this increase in traffic is a situation the local community is not used to hence may result to accidents to human and animals.

Mitigation

The contractor will put in place signs and barriers to direct vehicles and pedestrian traffic as needed around the construction area.

iii. Lose of vegetation

The terrain of the area is primarily open savannah grassland dotted with bushes. Keeping of livestock is a long held practice maintained by the Maasai and this accounts for 80% of the livelihood incomes in the pastoralist lifestyle and in the project area. The project site and its neighbourhood are occupied by savannah grassland dotted with bushes, shrubs and indigenous trees. About 70% of vegetation will be cleared to pave way for the project associated structures. This will expose soil to agent of soil erosion and also reduce vegetation cover. Indigenous vegetation that are also used as herbal medicine will also be interfered with.

Mitigation measure

- It will be ensured that project area to be affected by the construction works is demarcated. This will be aimed at ensuring that any disturbance to flora and fauna is restricted to the actual project site and avoid spillover effects on the neighboring areas.
- It shall be ensured that at least 30% of the current site vegetation cover is maintained.
- Locate project components where there are less vegetation to minimise vegetation disturbance
- Control soil erosion to avoid siltation that may occur in the nearby river
- Plant vegetation along the river bank as buffer zone; 30m from the highest flood level of River Mugor as buffer / riparian zone

iv. Disturbance to fauna

The area still habour wild animals including:- hyenas, antelopes, cheaters, snakes, wild birds and crocodiles in River Mugor though at a lower density. The dwellers of the project area are pastoralist hence the major domesticated animals include cows, sheep, and donkeys. Aquatic life found in River Mogor include: Catfish, Tilapia, Barbus sp, Carps sp, and, Haplochromis sp.

Construction of this project will affect these animals in that their habitat will be destroyed hence they will be pushed (forced to move) to other areas where there is habitat, roaming coverage will be reduced and they may be killed. For domestic animals the grazing area will reduce.

Mitigation

- No killing of animals found on site
- Maintain some vegetation cover that will be used by wild birds as their habitats
- Control soil erosion not to cause siltation that may lead to impacting on aquatic animals
- Give way to animals found crossing the road
- Liaise with KWS to handle/relocate wild animals found on site

v. Impacts as a result of Population increase

Development in general results in the influx of population. This particular development will require both skilled and unskilled labour during both construction and operation phases.

The area is not densely populated and any sudden influx of people will impact negatively on the use of utilities. The proposed factory is expected to employ over 300 persons during construction. It is therefore, expected that the population within the area will increase over time and enterprising individuals who will construct housing for staff will also attract larger population. Rapid population increase in an area also brings with it insecurity in most cases.

Mitigation Measures

- ✓ The sugar mill will source almost all of its unskilled labour from the local communities in order to reduce an influx of population from outside the area;
- ✓ Liaise with the local administration during hiring of employees to ensure that unwanted characters are not absorbed;
- ✓ Security will be enhanced in and around the project site.
- ✓ Security agencies will be requested to beef up the current small police post in the area.

vi. Noise pollution and vibration

The proposed project located in a village set up with a lot of tranquility. The construction works, delivery of materials by heavy trucks and the use of machinery/equipment including tractors, excavators, trucks, bulldozers, generators, grinders, mixers, blasting equipment, compactors and crushers together with drilling works will contribute to high levels of noise and vibration within the construction site and the surrounding area where ambient noise levels are low. This is anticipated to increase noise levels in the project area affecting particularly sensitive receptor areas such as immediate neighbors

Mitigation

- ✓ Switching of vehicles and machines when not in use;
- ✓ Avoiding unnecessary hooting,
- ✓ Insulate noisy machines;
- ✓ Workers working in noisy sections / areas to be provided with ear protection equipment,
- ✓ Workers using drilling equipment to be provided with specialized anti-vibrating gloves,
- ✓ Machines to be serviced to reduce generation of noise and vibrations;
- ✓ The noisy activities should be restricted to daytime;.
- ✓ Use quiet equipment (i.e. equipment designed with noise control elements).
- ✓ The contractor will ensure that NEMA noise and Vibration standards are observed

vii. Health and safety

Construction sites always present an element of danger. Construction workers are likely to encounter accidental injuries as a result of the intensive engineering and construction activities including erection and fastening of materials, metal grinding and cutting, concrete work, steel erection and welding among others. Such injuries can result from accidental falls from high elevations, injuries from hand tools and construction equipment cuts from sharp edges of metal sheets and collapse of building sections amongothers. Deaths have also been experienced as a result of poor construction activities leading to occupational health and safety concerns.

Workers are also likely to be exposed to diseases from building materials during the construction phase of the Project

Occupational health and safety of the workforce will have to be monitored by the respective contractor's supervisors and foremen. As long as proper procedures are followed and personal protective equipment (PPE) provided and their use enforced, risks of accidents and incidents can be substantially reduced.

Mitigation

- ✓ Construction workers and everyone at the site will be provided with personal protective equipment (PPEs) which must be used at all time on site.
- ✓ Reducing vehicle speed on project area and site site;
- ✓ Close supervision of work,
- ✓ The contractor shall insure all his workers.
- ✓ Foreman shall instruct workers on safety and health issues to avoid occurrence of accident.
- ✓ The contractor must be committed to adherence to the occupational health and safety rules and regulations stipulated in Occupational Safety and Health Act, 2007;
- ✓ Ensure safety of the construction workers by putting first aid area and injury reporting mechanism
- ✓ Ensure safety of the community by providing safety signs at strategic places around the access roads.
- ✓ Ensure compliance to Occupational Safety and Health Act Cap. 514 and its Subsidiary Legislations.
- ✓ There should be adequate provision of the requisite sanitation facilities including toilets and bathrooms;
- ✓ The workers should receive the requisite training especially on the operation of the machinery and equipment.
- ✓ Provide clean drinking water for the employees.
- ✓ Develop a site safety action plan detailing safety equipment to be used, emergency procedures, restriction on site, frequency and personnel responsible for safety inspections and controls.
- ✓ Recording of all injuries that occur on site in the incident register, corrective actions for their prevention are instigated as appropriate.
- ✓ Provision of prevention tools such as condoms at the dispensary and construction.
- ✓ Building materials will be inspected according to the occupational health and safety standards.

viii. Air Pollution and Climate Change

Project activities associated with implementation of the project will release pollutants that will affect the air quality, health and contribute to climate change. The pollutants will result from dust emission and exhaust fumes from vehicles for implementation. The clearance of vegetation will contribute to less carbon being sunk contributing to climate change. These emissions can have significant cardio-pulmonary and respiratory effects on the local population and project workers.

Dust Emission

Dust will be generated from dust from excavation works on site, dust from movement of vehicle on the road accessing the site and also within the site, use of building materials like ballast, cement and sand. It is also anticipated that construction activities particularly construction of access roads will increase dust emitted.

Mitigation measures

- The access roads to be watered during the construction period;
- Limit the speed on dusty roads to 30km/hr;
- Construction to take the shortest time possible;
- Workers to use masks when working in dusty conditions;
- Using dust nets to trap dust at construction sites;
- Ensure dust levels do not surpass the NEMA standard.
- Cover trucks hauling waste to reduce spillage on roads surface;
- Applying water to at least 80% of all inactive accessible disturbed surface areas on a daily basis when there is evidence of wind driven dust;

Exhaust fumes.

Increase in exhaust fumes is anticipated from moving automobile, construction machines and equipment during construction period. The emissions contain normally unburned hydrocarbons, nitrogen oxides, aromatic hydrocarbons, carbon dioxide, carbon monoxide and particulates. They are known to contribute to photochemical smog, health issues, acid rains and global climate change.

Mitigation measures

- Construction vehicles to have catalytic devices to ensure complete burning of waste gases,
- Use of clean petroleum that is low in sulphur, lead or other pollutants,
- Proper servicing of vehicles and construction machines
- Plant more vegetation for carbon sequestration
- Vehicle idling time shall be minimized;

ix. Disposal of solid waste

Construction activities create solid wastes that need to be disposed. Such wastes include:

- Excavated materials from the earth works and cleared vegetation;
- Construction debris including metals, timber, masonry waste,
- Paints, lubricants and petroleum wastes; Metal, glass, plastic
- Containers, cement paper bags and other packaging materials;
- Food remains.

These wastes if not properly handled may have a direct impact on the environment including: - un-aesthetics view, pest breeding, unhygienic conditions, pollution of nearby rivers, air impairment and pollution of physical environment. Disposal of the same solid wastes off-site could also be a social inconvenience if done in wrong places.

Mitigation

- ✓ There shall be no disposal of waste on the neighbouring plots without consent
- ✓ All waste shall be contained on site until collected for reuse or disposal.
- ✓ Provision material store to reduce the amount of waste caused by damage or exposure to the elements
- ✓ Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials
- ✓ Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
- ✓ Use of construction materials containing recycled content when possible and in accordance with accepted standards.
- ✓ Construction materials requirements are carefully budgeted to ensure that the amount of construction materials left on site after construction is kept minimal;
- ✓ Reuse and recycle waste where applicable and as much as possible to reduce amount of waste to be disposed;
- ✓ Remaining waste shall be disposed at a designated waste disposal site

x. Increased water demand

During construction phase, the construction works will require a lot of water for various uses ranging from activities of construction and contractors domestic workers. The site neighbours River Mugor and therefore water for construction works will be abstracted from river. . It is however, noted that flow rate of River Mugor is high and therefore intended abstraction will be insignificant hence it will not affect its use by other users downstream. However, miss use will result to unwanted water pumping / abstraction bill hence increased project cost.

Recommendation

Even though the use of water by this project from the intended source will not have adverse ecological impact, it is recommended that:-

- Recycling and Re-use of water within the project site
- Sensitizing construction workers to avoid irresponsible water use.
- Harvest rainwater and use in the construction activities;
- Install water saving taps;
- Promptly detect and repair of water pipes and tank leaks; and
- Install discharge meter to determine and monitor total water usage.
- Obtain water abstraction permit from WRA.

xi. Energy consumption

The proposed Project will consume fossil fuels to run transport vehicles and construction machinery. The machinery will include: construction vehicles and compactors. Fossil energy is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability. Electricity will also be used during the construction of the proposed Project. The consumption of electricity is likely to be on the higher side. It should be noted also that manual labour as a source of energy will mainly be used during construction of the proposed Project. Efficient management of energy consumption is therefore required for optimal performance of the Project and to control Project costs.

Mitigation

- Promote the use of solar energy and energy efficient bulbs for lighting more so at night.
- Maintained construction machinery to ensure optimal fossil fuel consumption
- Use energy-efficient construction machinery
- Ensure compliance with Energy Management Regulations of 2012.
- Maximize use of bolts in joineries instead of use of welding that requires use of electricity
- Sensitize staff to conserve electricity by switching off electrical equipment or appliances when they are not being used.
- Proper planning of transportation of materials will ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts.
- Contractor shall monitor energy use and set targets for reduction of energy use.
- Contractor will also develop energy management plan.

xii. Increased storm water runoff from new impervious areas

Site clearing, compaction due to movement of vehicle on site creating impervious areas will result to increased runoff coefficients than natural area resulting to increased soil erosion hence siltation and pollution of the neighbouring surface water body.

Mitigation

- Leveling the Project site to reduce run-off velocity and increase infiltration of rain water into the soil.
- Have in place a storm water management plan that minimizes impervious area infiltration by use of recharge areas and detention and/or retention with graduated outlet control structures
- Provision of slit traps in storm water drains
- Construction waste and excavated soil shall be heaped / handle away from storm water drain

xiii. Extraction and use of building materials

Building materials such as hard core, ballast, cement, rough stone and sand required for the construction will be obtained from quarries, hardware shops and sand harvesters. These materials are mainly extracted from natural resource bases such as river banks, and forests among others. Since substantial quantities of these materials will be required. The availability and sustainability of such resources at the extraction sites will be negatively affected as they are not renewable in the short term. In addition, the sites fromwhich the materials will be extracted may be significantly affected in several ways including landscape changes, displacement of animals and vegetation, poor visual quality and opening of depressions on the surface leading to several human and animal health impacts

Mitigation

- Building materials such as sand ballast hard core are extracted from registered quarry and sand mining firms whose facilities have undergone satisfactory environmental impact assessment/audit and received NEMA approval.
- Order for what will be required through accurate budgeting and estimation of actual construction requirement to avoid excessive extraction of materials
- Consider reuse of building materials and use of recycled building materials as it will lead to reduction in the amount of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.
- If any material or substance is used that is at any point in the future deemed to be deleterious to health, then it must be replaced with an acceptable alternative.

xiv. Oil spills

The machines to be used on site will have moving parts which will require continuous oiling to minimize the usual corrosion or wear and tear. Possibilities of such oils spilling and contaminating the soil on site are real. Likewise, moving vehicles on site may require oil change leading to oil spills. Construction machineries may also be fueled on site an activity that may lead to spillage of fuel. These spills if carried by storm water may end up in the nearby surface water resulting to water pollution hence affecting aquatic life on these rivers. Irrespective of these possibilities, no significant adverse effects are expected as a result of oil spills given the scope, nature and duration of time to be taken on the construction of the proposed Project.

Mitigation

The Contractor shall control dangers of oil and fuel spills during construction by:

- Service and fuel machinery in specific areas (garage) designated for this purpose;
- Prompt cleaning of oil and fuel spills,
- Provide water / oil interceptor
- Proper disposal of clothing or rags contaminated with oil will also take place.
- Used oil shall be contained in container that doesn't leak and in manner it will not spill over.
- Used oil shall be reused on site or collected for disposal or reuse elsewhere
- Used oil shall only be sold to a waste handler licensed by NEMA to handle such waste

xv. Soil pollution

Oil, fuel, grease and spillages, poor waste management that may lead to percolation of leachate into the soil and paint waste are occurrences that will lead to soil pollution. This is anticipated to change the chemical composition of the soils hence affecting the biochemical process.

Mitigation measures

- Ensure proper oil/fuel management as earlier on stated
- Ensure good waste management practice to prevent occurrence of leachate

xvi. Increase in Water pollution.

It is expected that with the development of site, water quality both for surface and ground water will be compromised. Activities that will be associated with water pollution will include; Wash down of debris generated from various construction activities, surface runoff from non-point and point sources pollution from various human-economic activities, poor disposal of solid wastes from construction camps, Poor management of oil and greases from contractor's service bays and spills from use of construction machines and equipment.

Similarly the influx of populations in the project area will increase waste and waste water generated and since the area does not have water treatment facilities, it will be drained back to the river channel untreated. Water pollution will affect the water parameters hindering normal chemical characteristics of the water and indirectly affecting all organisms that come in contact with the contaminated water.

Mitigation measures

- Ensure proper handling of loose soils during construction to prevent it from getting into storm water drain;
- The contractor's camps to have adequate sanitation facilities that can treat waste water before releasing into the environment;
- Ensure all repairs and maintenance work are done at the contractors' yard to avoid spillages,
- Compact loose material/soils and;
- Ensure recommended water quality standards of effluents from the contractors camp are adhered to as per the provisions of NEMA water quality regulation as shown in the baseline section on water quality.

xvii. Loss of aesthetic value

The project site has nice scenery in terms of vegetation, landscape. Clearance of vegetation, extraction of materials (borrow pits) and construction of factory will change the landscape of the area. This with poor waste and waste water disposal may result to loss of aesthetic value of the project area during project construction.

Mitigation measures

- Reinstating the site (borrow pits);
- Proper collection and disposal of waste
- Maintaining some vegetation and planting more
- Minimise on the excavations and ground disturbance

xviii. Change in land use

Currently the land use used agricultural land where farming and pastoralism is practiced. However, the project site has not been on any development activity other than being left fallow hence used by the community for pasture.

Mitigation:

The land will be subjected to change of use process hence its use will be changed from agricultural to industrial.

7.4.3. OPERATION PHASE

7.4.3.1. Positive impacts and mitigation measures during operation phase

Just as in the construction phase, there are positive impacts associated with this Sugar factory during its operation phase. These positive impacts are discussed below:

i. Competition in the sugar sub-sector

The proposed Sugar Factory is expected to reduce the monopolistic tendencies in the sector and allow farmers to choose where to sell their crop and thus provide them an improved platform to negotiate with respective factories as mutually interdependent partners. This will contribute to fair prices in sugar products

ii. Improvement in the livelihoods of the sugar farmers

The area farmers will gain from prompt payment of sugacane produce. Therefore farmers will be able to pay for the education of their children, acquisition of additional property notably land and construction of descent family shelter.

iii. Improved Infrastructure

The area road network will be improved and maintained by the proponent. Apart from necessitating easier access to farms, the improved road network will help the community in their various transport activities. Road improvement will be done through partnership between the project proponent, national government through the Kenya Sugar Board and Kenya Roads Board and the County Government of Narok.

iv. Employment opportunities

The operation workforce is estimated at up to 350 people. The proponent has agreed with the local people that it will ensure that first priority for employment will be given to the locals.

v. Improvement in local business

There is a likelihood of different types of businesses being set up in the neighbouring shopping centers: Masurura and Loliondo and environs. Such businesses will include housing, transport, hotels, restaurants and shops, agro vet shops among others. In addition, since the area will open up, there is a high possibility of more investments and businesses including sugarcane farm inputs which eventually will boost the local economy in a significant way. The influx of population will require accommodation in the vicinity as well as food stuff therefore creating demand for agricultural produce.

vi. Boost economy of the area

The employment will have an indirect injection of money into the local economy, with persons working on the project spending some of their wages in the local area. This will boost the economy of the area.

vii. Industrial development

The success of this project will offer other diverse benefits to Narok County including the upgrading of its industrial sector as an important economic and employment sector in the country. This is also in line with the Vision 2030 economic development agenda of refurbishing and expanding the manufacturing industries in Kenya.

viii. Optimal use of land

The proposed sugar factory project will enhance economy of land through intensification of land use in addition to provision of sugar and related by -products. This will be significant since the country is currently experiencing shortage of sugar and related by -products.

ix. Increase in revenue to the National and County Government

The operation of the proposed Project will result in positive gains for numerous authorities-The local county government, Kenya Revenue Authority (KRA), Kenya Power and Lighting Company (KPLC), Kenya Sugar Board (KSB) through payment of relevant taxes, rates and fees to respective institutions.

x. Improved amenities

The operation of the proposed sugar factory is expected to improve amenities such as roads, water, health care and social facilities in the surrounding area as part of Corporate Social Responsibility (CSR).

xi. Reduced transport cost and time

Location of this project in this area will shorten the distance between the farmer and the factory hence reducing the time and the cost incurred by the cane farmer and the factory in long distance transportation of the cane to far factories.

xii. Prompt harvest

Cane overgrowing and overstaying on the farm is a problem currently faced by sugarcane farmers in this area. Therefore locating this project in this area will ensure canes are harvested in good time and therefore the canes will not be left to overgrow / over stay on the farm.

xiii. Reduced conflict

Cattle rustling are common in the area and therefore implementation of this project will help to reduce cases of cattle rustling in the area as many will resort to sugarcane farming instead of pastoralism.

xiv. Power supply

The factory will generate its own power that may be supplied to neighbouring households or sold to KPLC.

7.4.3.2. Negative impacts and mitigation measures during operation phase

The following negative impacts are associated with the proposed sugar Project during its operation phase.

i. Vegetation coverage

During construction a lot of vegetation was cleared and therefore there is a need to ensure that the project complies with government requirement on at least 10% vegetation cover.

During farming, farmers will clear indigenous vegetation to plant sugarcane hence reduced tree cover. Measures need therefore to be put in place to ensure that vegetation cover is maintained.

Mitigation

- During project planning, the company through its extension officers to sensitize farmers not to clear all trees to cultivate sugarcane but to keep some. This is because most of the trees are used for medicinal purposes, fodder for the livestock and they are also necessary for environmental conservation.
- Company to have a policy that will require that a farmer must plant a given number of trees depending on the acreage on his/her farm
- The company to have a tree nursery and also to partner with the local tree seedling producers to give farmers trees to plant on their farms. Trees must be those that survives and grown in the area
- The company to have a landscaping program that will ensure that the company is landscaped with trees, ornamental shrubs and grass to at least 10% vegetation coverage.

ii. Impact on food security

The proposed sugar factory will need sugarcane for milling and therefore there is a possibility of farmers dedicating most of their land to sugarcane production at the expense of food crops. This may lead to the challenge of food insecurity.

Mitigation

- The factory agricultural extension personnel to train and sensitize farmers on intercropping sugarcane with other crops including practicing pastoralism on their farms
- There will be strict adherence to the policy of farmers being allowed to cultivate not more than $1/3^{rd}$ of their land with sugarcane, hence leaving not less than 2/3rd of the same for other use including food crops.

iii. Increased water use

The industrial activities during the operation phase of the Project will involve use of large quantity of water in its processing and domestic use. This will increase water demand in project area. Currently River Migori is the lifeline of the community for various domestic and pastoralist usage, hence the need to regulate and control water abstraction and use from the river.

Mitigation

A combination of water saving appliances and water management measures will be planned and implemented within the proposed sugar factory. Specific measures that will be implemented include the following:

- Re-use the water for cooling purposes;
- Recycle process water and apply to the washing of incoming raw material;
- Use closed loops for intensive solid generating washings, (e.g. cane and beet wash) and flue gas scrubbers.
- Promote awareness on water conservation and reducing water wastage;
- Quick fixing of licking pipes; and
- Sweep with a broom and pan where possible, rather than hose down external areas. The following water saving investments should be taken into consideration:
- Reduce water delivery in taps, through the installation of low flow devices
- A manually pressed button flush valve which stops on release of button; and
- Water efficient plumbing fixtures to save water and energy.
- Rain water harvesting should be taken into consideration to capture rain water and store.
- Cooling Water and evaporator cooling water are safe hence can be reused safely
- Keeping the temperature of incoming water between 30^0 and 35^0 C can reduce losses due to evaporation.
- Recycling clarified water from ash settling pond and condensate tank overflow for cleaning purposes;
- Through waste minimization, it is possible to minimize water consumption by almost 80%. As a result, abstraction from the surface water source (a river) is reduced thus conserving water resource.

iv. Waste water management

Sources and impacts

Mill house: Mill house wastewater is derived from continuous gland cooling and intermittent floor washing and contains high amounts of oils and grease and sugar from spills and leaks.

Boiler Blow-down: Boiler blow-down is fairly clean water except that it contains high dissolved solids and phosphates.

Rotary filter: Filter cloth is periodically washed and constitutes a source of wastewater.

Condensates: The vapours from the last effect evaporator and pan boiling are separately cooled in barometric condensers and the condensate goes to the pond. Part of the cooled water from the pond is recycled into the sugar mill, but a large portion is discharged as wastewater. If the mill operates without overloading, the evaporator and vacuum pan condensate is quite clean and the entire quantity can be reused. But many a times, overloading and poor operating conditions can lead to significant sugar losses in the condensates through entrainment and thus polluting the water.

Occasional Spills and Leaks: Leaks from pumps and pipes in the evaporators and centrifuge house, along with periodical floor washings, constitute another source of wastewater. Although the flow is intermittent and volume discharged is not large, it represents the most polluting fraction of sugar mill wastewater.

Condensate Washings: Evaporators, juice heaters, pans, etc are cleaned once in 20 days for removal of deposited scales. Caustic soda, sodium bicarbonate and hydrochloric acid are used for scale removal. Normally the caustic soda washings are stored and reused for cleaning operations. After the equipment is boiled with caustic soda and rinsed with fresh water, it is cleaned with dilute hydrochloric acid using an inhibitor. The wastewater is discharged into the drains, as the recovery of the chemicals may not prove to be economical. It is seen that the wastewater has small organic load but inorganic content may be high to pose a shock-load to wastewater treatment facility (occasional discharge, once in fortnight). It is suggested to have a holding tank and mix this wastewater gradually to the final effluent to avoid shock loading on the treatment plant.

Sulphur and Lime Houses: The washings of sulphur and lime house would contain a considerable amount of inorganic solids, which include carbonates and sulphates. The effluents from these two units when combined would give neutral pH value of waste. This wastewater does not contribute to organic pollution but can be characterized as inorganic wastewater.

Mitigation Measures:

- Waste water treatment plant will be constructed to handle waste water from the factory processing section.
- There will be aerobic and anaerobic treatment before the treated waters are passed through an artificial wetland to be put up. The artificial wetland will have various plants that have a high capacity to absorb nutrients such as alfalfa, papyrus,
- Ensure the effluent treatment plant is well operated and that proper monitoring takes place to make sure that the surrounding environment is not polluted.
- Provide grease trap to eliminate grease and oil before the waste water is drained into the treatment system
- Store molasses in RCC tanks or steel tanks above ground level to prevent ground water contamination. The high BOD of molasses may cause pollution problems due to miss handling.
- Housekeeping measures such as monitoring oil spills, repair of leaking pumps, removing debris from canals to minimise content of pollutants in the waste water

v. Residuals from Wastewater Treatment Operations

Sludge from a waste treatment plant needs to be evaluated on a case-by-case basis to establish whether it constitutes a hazardous or a non-hazardous waste and managed accordingly.

vi. Sanitary Wastewater

Sanitary wastewater from industrial facilities may include effluents from domestic sewage (washrooms within the factory, office / staff kitchenette and from residential [staff quarters] section), food service, and laundry facilities serving site employees. Miscellaneous wastewater from laboratories, medical infirmaries, water softening etc. may also be discharged to the sanitary wastewater treatment system.

Mitigation

- These waste water will be treated differently from the processing / factory waste water;
- Segregation of wastewater streams to ensure compatibility with selected treatment option (e.g. septic system and bio digester);
- Segregation and pretreatment of oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into sewer systems;
- Sludge from sanitary wastewater treatment systems should be disposed of by a licensed NEMA Registered Waste disposal management entity.

vii. Waste water monitoring

A wastewater and water quality monitoring program/section with adequate resources and management oversight should be developed and implemented to meet the objective(s) of the monitoring program. Management of industrial wastewater is regulated in the EMC (Waste Management) Regulations 2006. Through use of these guidelines and good practice techniques for wastewater management, facilities should meet the Guideline Values for wastewater discharge.

Recommendation

- Have a department / section handling water quality monitoring
- There shall be a personnel designated / employed to man and operate the waste management system
- Have and located Effluent sampling point at strategic upstream points and discharge point.
- Sampling shall be conducted by or under the supervision of trained individuals.
- Analysis should be conducted by entities permitted or certified/accredited for this purpose.
- Sampling and Analysis Quality Assurance/Quality Control (QA/QC) plans should be prepared and, implemented. QA/QC documentation shall be included in monitoring reports.
- Comply with EMC (Water quality) Regulations 2006 by
  - ✓ Having appropriate liquid waste treatment facility,
  - ✓ Ensuring that the effluent discharged meet the set standards and
  - ✓ Acquiring effluent discharge license

viii. Increased storm water flow

Storm water includes any surface runoff and flows resulting from precipitation, drainage or other sources.

Typically storm water runoff contains suspended sediments, metals, petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs), coliform, etc. these is carried downstream hence resulting to degrading the quality of the receiving water (River Migori and Steti). Its rapid runoff also causes erosion.

Mitigation Measures:

In order to reduce the need for storm water treatment, the following principles should be applied:

- ✓ Storm water should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge
- ✓ Runoff from process and storage areas should be segregated from potentially less contaminated runoff

- ✓ Runoff from areas without potential sources of contamination should be minimized (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate should be reduced (e.g. by using vegetated swales and retention ponds);
- ✓ Where storm water treatment is deemed necessary to protect the quality of receiving water bodies, priority should be given to managing and treating the first flush of storm water runoff where the majority of potential contaminants tend to be present;
- ✓ When water quality criteria allow, storm water should be managed as a resource, either for groundwater recharge or for meeting water needs at the facility;
- ✓ Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas.
- ✓ Sludge from storm water catchments or collection and treatment systems may contain elevated levels of pollutants and should be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety, and conservation and long term sustainability of water and land resources.
- ✓ Good housekeeping to avoid contamination of storm water;
- ✓ Provision of slit traps in storm water drains; and
- ✓ Regular inspection and cleaning of storm drains.

ix. Pollution due to Hazardous Materials Spills

Wastes that are considered hazardous in Kenya are defined as those that are listed in the fifth schedule of the National Environment (Waste Management) Regulations (1999). Hazardous materials include substances, if released, may pose risks to the environment or to the health and safety of people or wildlife. Hazardous materials to be used at the factory will include the following:- Process Chemicals, Sulphur (Lime), Caustic soda and washing soda, Talocide (antibacterial spray applied in vicinity of milling equipment), Phosphoric acid,Seperan/Flocculant, Sodium hydrosulphite, Fuels - petroleum storage tanks, lubricating oils and Empty waste oil drums

Impacts

A hazardous materials spill may occur from improper storage, carelessness, fuelling activities, or as a result of a vehicle accident. Depending on the location of the spill, impacts to surface water, groundwater, and/or soil could result.

Mitigation Measures

- Develop a spill prevention plan.
- Ensure that chemical containers are labeled and documentation regarding safe handling or first aid measures are accessible from every storage and use location.

- Make spill clean-up equipment readily available in chemical storage areas.
- Ensure that chemical containers are stored in a safe fashion to reduce the potential for containers falling over and spilling.
- Storage of fuels and other hazardous materials will be conducted in designated locations only
- Work will be monitored during construction to ensure there are no releases of deleterious substances.
- Re-fuelling and maintenance of equipment will be conducted in designated (properly designed and constructed) locations only.
- Workers who handle the chemicals will be provided training in chemical safety, spill management and prevention and personal protective equipment.
- Provide emergency showers or eyewash stations in areas where some chemicals are handled.

x. Management of bagasse and press mud

Bagasse:

It is estimated that bagasse contributes to 33.3% residue of the total cane crushed. It has a calorific value of about 1920 kcal/kg and is mainly used as fuel in boilers for steam generation. If not well managed it generates leachate that end up polluting the soil, creates nuisance as it has offensive smell, is a nuisance to the neighbourhood and it also pollutes nearby rivers if it flows into it and underground water if it percolates down through the soil.

Mitigation

- ✓ Bagasse will be stored in an area far from other factory activities; more so fire related activities
- ✓ Heaping section will be provided with lining to prevent leachate from percolating down the soil
- ✓ Heaping section will be provided with leachate drainage and containment/treatment lagoons / treatment system to ensure the leachate is pre-treated before discharge into the company main waste water treatment plant through pumping/connection via sewer line / exhausting.
- ✓ To minimise its amount, the company can sell it out to those reusing it for briquette making and other re-users/ recyclers.

Press Mud:

Press mud contains all non-sucrose impurities along with CaCO3 precipitate and sulphate. Press mud from double sulphitation process contains valuable nutrients like nitrogen, phosphorous, potassium, etc, and therefore used as fertilizer. The press mud from double carbonation process is used for land

filling and is not used as manure.

xi. Solid waste generation

Operation activities of the project; factory and staff quarters will lead to the production of solid wastes such as used tires, worn out machinery and equipment parts (metal, electronic, plastic components), garage and workshop wastes, office wastes and general domestic wastes including garbage among others.

Outside the factory, growth of the Agro Industry is expected to further introduce new stream of waste resulting from sugarcane farm inputs such as fertilizer and pesticides products associated with sugarcane farming activities. Dropping of sugarcane when being transported to the factory also will untidy the roads, town centres/markets/shopping centres where cane transporting vehicle will use.

Population influx on the other hand together with improved standards of living will improve the purchasing power of the people. Such will lead to more wastes being generated thereof.

The effects of improperly waste management could be detrimental causing environmental pollution, nuisance to the local communities, and increased vermin among other undesirable effects.

Mitigation measures

- Ensure segregation of waste to promote reuse, recycling, reduction and appropriated disposal strategies
- Metal and plastic waste will be sold to scrap metal dealers for recycling; Scrap metal council guidelines shall be adhered to;
- Waste collection points; skips and bins, shall be positioned in area not susceptible to storm water so that they are not carried by storm water to nearby surface water bodies;
- Adequate litter collection facilities; dirt bins and skips, in all generation areas be provided,
- Have own waste disposal site approved by NEMA,
- Chemical and hazardous wastes should not be burnt or dumped in open pits
- The company through their harvesting supervisors will ensure that canes are tightly loaded to avoid scatter or dropping (littering) when on transit.
- The company will also partner with county government department in charge of waste management to organize periodic cleanup activities to clean the wastes.
- All contracted waste management companies including those collecting waste for reuse/recycling i.e scrap metals, used tires e.t.c must be in compliance with waste management regulation of 2003 and county government laws. This will include having requisite permits, licenses and tracking documents.
- Partner with county government in waste management by providing waste bins and skips

to be located in nearby Shopping Centres and towns.

xii. Emissions to Air

Air emissions in sugar manufacturing are primarily related to particulate matter generated from:

- Bagasse-fired steam boilers,
- Exhaust emissions,
- Dust from unpaved access roads and areas,
- Sugar drying or packing activities; and
- Inadequate cleaning of the raw material that result in fermented juice, which will also create a foul smell.

Particulate Matter and Dust

Exhaust gas emissions produced by the combustion of organic materials in boilers for power and heat generation can be the most significant source of air emissions in sugar processing activities. Air emission specifications should be considered during all equipment selection and procurement.

Mitigation

- The boiler to be designed to have particulate matter control (e.g. flue gas cyclones, fabric filters, or electrostatic precipitators, wet scrubbers and local recirculation systems) to capture the ash and recycle the water to prevent the emission of particulate;
- Use wet scrubbers to remove dust from drying and cooling of sugar;
- Reduce fugitive dust from roads and areas within the factory by cleaning and maintaining a sufficient level of humidity;
- Install ventilation systems with filters on transport systems for dry sugar and on sugar packing equipment.

Dust Generation during Bagasse Handling, Storage and Disposal

While not a hazardous material, bagasse creates nuisance dust and is thus damaging to the environment. The proponent proposes to use bagasse to generate power for use in the sugar mill. However, all of it will not be utilized

Mitigation Measures

- The company will develop a bagasse handling management plan to manage bagasse supply and demand to the boilers and to ensure bagasse quality is maintained during storage.
- Repair leakages in bagasse and bagacillo chutes to reduce dust releases.
- Ensure an enclosed bagasse shed to keep the dust enclosed.
- Provide Personal Protective Equipment and training to personnel working directly with bagasse.

Air Quality Deterioration Due to Fossil Fuel Emissions

It is unlikely that air quality will be affected by fossil fuel emissions generated during project activities more so from company machineries and equipment using fossil fuels. Even though the residual effect of decreased air quality due to fossil fuel emissions was evaluated to be of low consequence in the project study area, there is a continual effort to decrease worldly emissions; therefore, mitigation is required.

Mitigation Measures

- Ensure that vehicles and equipment are inspected and maintained to prevent unnecessary increase in fuel consumption hence more exhaust emission. A poorly maintained engine and under-inflated tires can increase fuel consumption by up to 10% and 4 to 8%, respectively.
- Vehicles and equipment will not be left idling when not in use.
- Ensuring a high standard of inspection, maintenance, and operational practices as it is an effective method of controlling excess emissions from vehicle and equipment use to an acceptable level.

Air pollution from use of agrochemical

Pesticides and commercial fertilizers are some of the common agrochemicals used in agricultural production within the project area. It is anticipated that intensification of agricultural production particularly sugarcane will necessitate increased use of aerosol chemicals to control pests and diseases as well as improving soil fertility. However, the use of these chemicals products will lead to air pollution.

Mitigation measures

- Use of personal protection gears during spraying,
- Adoption of integrated pest management practices,
- Planting of wind break vegetation,
- Spraying of crops should be done on a calm day,
- Adoption of sustainable agricultural practices and
- Strict following of manufacturer's directions when using agrochemicals

Greenhouse gases

Agricultural activities stated in the project area will lead to production of greenhouse gases including water vapour, carbon dioxide (CO2), methane (CH4) through a process known as methanogenesis, nitrous oxide (N2O: dinitrogen monoxide) and nitric oxide (NO). The gases will be generated from

applied nitrogen fertilizers, digestive process of ruminant animals, animal wastes, evapotranspiration and microbial activities particularly in the paddy

Mitigation measures

- ✓ Provide farms with press mud to be used as manure
- ✓ Avoiding biomass burning but instead use it for compost organic manure.
- ✓ Apply crop residues or organic manure to dry fields to increase aerobic decomposition of the matter
- ✓ Practice agroforestry and intercropping by planting plants with high primary productivity for carbon sequestration.

xiii. Increased Traffic

Impact During operations, there shall be additional vehicles supplying materials and collecting the finished product. There will also be heavy and light vehicles moving in and out of the compound supplying various materials or bringing in staff. The additional traffic, estimated to be approximately 100 vehicles per day may cause an impact on the access road to site and particularly on Kehancha – Lolgorian.

However, the above estimated increase in traffic density is within acceptable limits and should not cause any undue hindrance to the free flowing traffic in the area. Moreover, most of this traffic will occur during the daytime.

Mitigation Measures

- Install speed bumps on the road to slow down speeding vehicles that may cause accidents when vehicles wish to turn into the site;
- The sugar mill management should set up a common transport system for her employees with a view to encourage mass transport;

xiv. Fire Hazards Impacts:

Fire may present a very real potential danger for the sugar mill and its amenities. The principal potential hazard is bagasse and fires from the boiler. This derives from its inherent quality of high flammability. Such an occurrence will inevitably have an environmental bearing on the atmosphere. A fire is a combustion which develops in a totally uncontrolled manner with respect to time and space. It produces tremendous quantities of heat, smoke and polluting and even toxic gases. The energy generated further favors the spreading of the fire.

Mitigation Measures

- A fire alarm system comprising of break glass call points, fire detectors, sirens and a control indicator panel will be installed in all sections within the factory and staff quarters
- Hose reels systems with a permanent connection to a pressurized water supply will be put in place strategically positioned
- Put in place and position portable firefighting equipment in compliance with the current standards, at conspicuous locations; storage tanks, loading and unloading system, generator room etc.
- Speedy evacuation plans will be included in the building plans for the eventuality of a fire;
- Evacuation signs (exit) will be placed at strategic locations in the building. Fortunately, there is ample open space around the facility to act as a retreat in case of a fire emergency
- Sprinklers and connection to pressured water supply to be installed in the bagasse shed to douse any fire outbreaks in this area
- Procedures to follow in case of fire will be displayed along corridors, individual offices and in public ways to ensure safe and speedy evacuation of personnel and visitors.
- A fire escape must be provided with wide open escape routes to allow speedy exit.
- The staff will be trained on fire fighting and fire drill and first aid.
- A 200,000 litres water tank connected to water sprinkler system will be constructed.
- All guidelines, norms, specifications and conditions likely to be imposed by the Government will be strictly compiled with.

xv. Noise and vibration

The project is expected to generate noise resulting from the boiler, workshop, garage, at the control room and use of Machineries. These noises will affect those within the noise generation vicinity i.e. in the workshop, garage, control room and those using machineries. Only noise from Boiler is expected to generate noise that will affect those within and outside the factory.

Mitigation Measures

- ✓ Use equipment with lower sound power levels
- ✓ Installing suitable mufflers on engine exhausts including compressor components
- ✓ Installing acoustic enclosures for equipment causing radiating noise
- ✓ Improving the acoustic performance of constructed buildings, apply sound insulation technique
- ✓ Installing vibration isolation for mechanical equipment

- ✓ Limiting the hours of operation for specific pieces of equipment or operations and limiting the number of equipment operating simultaneously where the noise level exceeds ambient levels of 70 dB by more than 20 dB.
- ✓ Locate noise sources to less sensitive areas
- ✓ Reducing project traffic routing through community areas wherever possible
- ✓ Developing a mechanism to record and respond to noise complaints
- ✓ Monitor noise levels and undertake necessary measures to minimise / prevent its effect
- ✓ Equipment and vehicles will not be left idling for longer than 10 minutes at a time
- ✓ Provide hearing protection to staff working in noisy area
- ✓ Put in place clear warning signs indicating high level noise areas and emphasis of noise protection equipment
- ✓ Noise levels will be monitored semi-monthly and necessary actions taken to mitigate effect.

xvi. Energy consumption

The proposed Project will consume fossil fuels to run and heat the machinery, lightingand other operations. Fossil energy is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability. Electricity will also be used during the operation of the proposed Project. The consumption of electricity is likely to be on the higher side. It should be noted also that manual labour asa source of energy will mainly be used during operation of the proposed Project. Efficient management of energy consumption is therefore required for optimal performance of theProject and to control Project costs.

Mitigation

- The factory will produce its own electricity
- Use the most efficient lighting system design appropriate for the required application in various stages of industrial processes;
- Adopting the most effective lighting controls to ensure optimum operating efficiency and minimum energy wastage, e.g. central programmable time switches;
- Installing energy saving appliances e.g. energy saving bulbs;
- Maximizing the contribution of daylight to reduce the use of artificial lighting
- Install solar lighting system more so for security lighting, street light and other uses
- Paint interior of buildings light color

xvii. Occupational Health and Safety

Occupational health and safety hazards for sugar manufacturing facilities are similar to those of other industrial facilities and recommendations for the management of these issues can be found in the OSHA 2007. In addition, occupational health and safety issues that may be specifically associated with sugar manufacturing operations include the following:

- Physical hazards including:- trips, falls, and materials handling hazards
- Exposure to dust and biological hazards
- Exposure to chemicals (including gases and vapors)
- Exposure to heat, cold and radiation
- Exposure to noise and vibrations

Recommendations

During the operation of the project emphasis will be placed on providing a safe and healthy environment for the workers and the general public. A Health, Safety, and Environmental (HSE) Management Manual will be prepared to clearly define the responsibilities and procedures to be implemented. Adequate risk assessment and emergency response plans and procedures to handle unforeseen risks and emergencies must be incorporated in the HSE manual.

In so doing the company will implement a Health and Safety Program as an integral component of operations. Therefore the company will be committed to the health and safety of its employees and ensure compliance to the OSH Act (2007). Several components of the health and safety program will consist of the following:-

- Establishment of a Health and Safety Committee
- Training employees on environmental health and safety. This is will be a continuous process.
- Enforcing compliance to Health, safety and environment policies and procedures;
- Monitoring of the effectiveness of training programmes for all categories of employees;
- Prepared and implemented Occupational Safety and Health plans to enforce compliance with the regulations of the OHS Act 2007. The plan will be implemented in the following areas: Industrial accident prevention and management, Occupational hygiene, Illness and infectious disease prevention and management, Sewage and waste disposal.

Industrial Accident Prevention and Management will include:- Hazard identification and control, Monitoring and reporting of industrial accidents, training or education of employees in industrial first aid, Industrial Accident Protocol and Fire Safety and Preparation;

On training and education of Employees and in conformance with the objectives of the safety program the following training programs will be implemented:

- ✓ Basic first aid programmes (all employees).
- ✓ Advanced first aid programmes (ten employees).
- ✓ Accident investigation and reporting seminars (supervisory personnel and safety reps)

The basic first aid program will be extended to all employees and will be geared to provide that in the event of an accident or injury, someone with first aid knowledge will always be present to render initial assistance until further medical attention can be made available. Qualified personnel will run seminars to impart the necessary theoretical as well as practical skills required. In handling safety and health issues there shall be a defined protocol and responsibilities (employee and employer through supervisor/manager).

The supervisor/manager has the obligation to:

- ✓ Inspect all machines and equipment for the existence of potential hazards and maintain them in working order.
- ✓ Inform the worker of any hazards present;
- ✓ Instruct the employees in the correct safe work procedure and audit compliance with those instructions
- ✓ Provide the necessary safety protective gear when required.

The employee on the other hand has the obligation to:

- ✓ Cease work once a hazard is perceived.
- ✓ Report the hazard to the supervisor who will in company with the safety representative, inspect the condition or circumstance and determine its validity.
- ✓ Obey the instruction to perform alternative work or cease work completely as directed by the supervisor.
- ✓ Return to the workstation or proceed once the hazard has been adequately dealt with or eliminated.

In the event of an industrial accident the following protocol will be followed:

- ✓ A basic first aider will be summoned if not already present at the scene of accident,
- ✓ The basic first aider will render first aid care,
- ✓ The basic first aider will summon an advanced first aider who will administer further care if necessary and evaluate the necessity for removal to the first aid centre,
- ✓ The advanced first aider will summon the vehicle specifically identified for this purpose and supervise the removal of the injured to the first aid station,
- ✓ The employee's immediate supervisor will be informed. He will then:
    - Make contact with the identified medical practitioner and institution and inform them of the time of arrival of the injured employee.
    - Complete the accident form and forward same along with the injured to the medical institution for completion by medical practitioner
    - Inform the Safety representative who will record the accident in the industrial accident register.

A vehicle should be available at all times to respond to accidents. That vehicle should be four wheel drive and have all the required emergency handling features (ambulance).

On Safety Preventive measures the following will be undertaken

e. Physical hazards

The employees are likely to encounter accidental injuries as a result of the intensive engineering and plant operation activities. Such injuries can result from accidental falls from high elevations, injuries from hand tools, trips, handling hazards materials and operation equipment cuts from sharp edges of metal sheets among others.

Recommended measures

- ✓ Install catch platforms under conveyors that cross passageways or roadways;
- ✓ Quickly clean up spills;
- ✓ Use non-skid walking surfaces that allow drainage;
- ✓ Install guard rails on walkways adjacent to production lines or at height, and clearly mark traffic lanes for vehicles and pedestrians;
- ✓ Equip mobile equipment with roll-over protection.
- ✓ Establish routines checkup to ensure that heavy loads are not moved by crane over personnel;
- ✓ The upper floors of the sugar mill must be fitted and equipped with chequered plate hand rails wherever possible

- ✓ Workers at site will be adequately provided with Personal Protective Equipment (PPE). Equipment to be provided will include worker's boots, helmets, dust masks, gloves, safety harnesses, goggles and ear muffs
- ✓ There will be adequate first aid kits placed at easily accessible points
- ✓ All pipes should be colour coded and steam pipes will be properly installed and indicated where necessary
- ✓ OSHA Act and WIBA should be strictly adhered to by the management
- ✓ should consider Public Liability Insurance in case of accidents to visitors

f. Confined Spaces

Operation and especially maintenance work may include confined space entry. Examples include: boilers, dryers, degreasers, digesters, blow pits, pipeline pits, process and reaction vessels, tanks, and vats.

A confined space is defined as a wholly or partially enclosed space not designed or intended for human occupancy and in which a hazardous atmosphere could develop as a result of the contents, location or construction of the confined space or due to work done in or around the confined space. Confined space is one that also contains physical or atmospheric hazards that could trap or engulf the person.

Confined spaces can occur in enclosed or open structures or locations. Serious injury or fatality can result from inadequate preparation to enter a confined space or in attempting a rescue from a confined space.

Recommendations

- ✓ Engineering measures should be implemented to eliminate, to the degree feasible, the existence and adverse character of confined spaces.
- ✓ Permit-required for confined spaces should be provided with permanent safety measures for venting, monitoring, and rescue operations, to the extent possible.
- ✓ The area adjoining an access to a confined space should provide ample room for emergency and rescue operation

g. Community Health and Safety

These are health and safety impacts related to the public outside the factory premise during all phases of the project.

- ✓ Locating associated facilities such as worker camps close to project sites and arranging worker bus transport to minimizing external traffic

- ✓ Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions.
- ✓ Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or hospitals or other locations where children may be present. Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaigns)
- ✓ There should be speed bumps on the road to slow down speeding vehicles hence reducing accidents and dust generation that may have health risk to the community and road users
- ✓ Signage will be posted within the project area and along the transportation route to warn people of large vehicle movement and turning as well as on increased traffic. Such signage will be clear and easily visible
- ✓ The company will undertake periodic monitoring and consultation with the local communities to identify any major impacts (including the emerging once) and implement appropriate mitigation measures.

h. Security

Security within the premises is a major issue that must be addressed as lack of security can be an environmental hazard to the staff within the institution. The aim of a security system is to ensure the safety and security of the staff, clients and visitors to the facility, to protect the property of company against any hostile activity e.g. theft, vandalism etc, to maintain public order and proper behavior in the plant and to allow the users of the facility a quiet environment and privacy. It will also enable a fast and efficient response in case of any accident which requires interaction with external authorities such as police, emergency, first-aid, etc. Security also guarantees the proper, fitful and honest behavior of all employees.

Mitigation Measures

24 hours security should be provided within the premises and at the entrance to the facility by

- Installation of an entrance and exit security check. This requires a proper gate and gate house, and security system to check those entering and exiting;
- Procedures to leave items such as cigarettes, matchsticks, lighters, mobile phones, etc at the gate as a security measure to be put in place
- Well trained security officers from a reputable company to patrol the grounds
- The company should install an internal surveillance system that will monitor the plant at all times.

i. Traffic Safety Impact

Traffic accidents have become one of the most significant causes of injuries and fatalities among members of the public worldwide. Traffic safety should be promoted by all project personnel during all time more so during operation of project equipment on the roads. Prevention and control of traffic related injuries and fatalities should include the adoption of safety measures that are protective of project workers and of road users, including those who are most vulnerable to road traffic accidents.

Mitigation Measures:

- ✓ Emphasizing safety aspects among drivers
- ✓ Improving driving skills and requiring licensing of drivers
- ✓ Adopting limits for trip duration and arranging driver rosters to avoid overtiredness
- ✓ Avoiding dangerous routes and times of day to reduce the risk of accidents
- ✓ Use of speed control devices (governors) on trucks, and remote monitoring of driver actions
- ✓ Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
- ✓ Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or hospitals or other locations where children may be present. Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaigns)
- ✓ Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents
- ✓ Locating associated facilities such as worker camps close to project sites and arranging worker bus transport to minimizing external traffic
- ✓ Employing safe traffic control measures, including road signs to warn of dangerous conditions.

7.4.3.3. Negative social impacts

a) Land use conflicts

Many farmers would want to do sugarcane farming which will lead to reduced grazing land, this may create conflict among the pastoralists and farmers

Mitigation:

- The Company will train farmers on ways to balance farming and pastoralism
- Sugarcane leaves mixed with molasses will be used as animal feeds
- The company together with the local leadership will form a grievance redress mechanism to address issues that may arise.

b) Insecurity

In many areas where sugarcane farming is practiced there is always a tendency of gangs and thieves hiding in the sugar plantations. This may cause lack of freedom of movement in the area and also increase rape and theft cases.

Mitigation:

- Community to partner with local authority to ensure good security (community policing)
- Putting up floodlights and street lights in risky areas

c) Child labour

Since sugarcane farming generates much money, many parents may engage their children in farming activities such as weeding and planting as opposed to going to school. Underage children may also be allocated heavy works and over-worked as well.

Mitigation:

- Company will employ field officers who will monitor farm activities to ensure that children are not involved in intensive farming activities (child labour)

d) School drop-outs

Sugarcane farming may lead to drop-out of school going pupils and students. In many areas where sugarcane is practiced many children do not go for further schooling and many do fail to attend secondary education as they would want have their own sugarcane farms that will generate them income. This will affect the 100% transition in education as required by the ministry of Education

Mitigation:

- Local authority to do monitoring and follow ups cases of schools drop outs in the community

e) Break- up in families

Stable income flow as a result of sugarcane farming will increase living standard of the farmers. As a result, many male farmers would want to get second wives or marry many wives. This will create conflicts among families and increased divorce cases.

Mitigation:

- Company will come up with a farmers' cooperative society where famers will have their money banked and given in installments to avoid misuse
- Conducting Social education on impacts of money use, investment, banking and effects of family break ups

f) Human Immune Virus (HIV)

Increased income from sugarcane farming may also cause mismanagement of money and this may encourage prostitution in the community. This will have a high risk of people contracting sexually transmitted disease such as HIV

Mitigation:

- Creating awareness on HIV and how it can be transmitted and its impacts on the infected persons.
- Company may also construct booths to be used as VCT centres where the community can access to know their HIV statuses
- The project proponent will need to work jointly with appropriate county and national government health agencies to come with a comprehensive STD, HIV and AIDs control program during the construction of the project
- Develop a comprehensive STDS, HIV and AIDs awareness and control program such as provision of condoms to workers both male and female

g) Rural- urban movements of people

Industrialization of the area will make more people move from the rural areas to the urban town where the industry is located. Social interactions with different people with unique beliefs may affect the Maasai cultural beliefs as a result of urbanization.

Mitigation:

- Company to ensure centralized distribution of resources to minimize such movements

h) Gender based conflicts

In Maasai community women are not give equal opportunities as men, this may affect equality on women employment as men would want women to stay at home but not to get employed.

Mitigation:

- Sensitizing the community on the importance of gender equality and roles.

i) Cultural changes

The proposed development is anticipated to attract people to the project area. This might put pressure on various resources and influence change of culture of the local people. Further, the new farming technologies associated with the project is expected to shift the traditional system to highly skilled and mechanized farming practice. The establishment of the Agro industry is expected to bring more changes to the local residents as a result of development of new technologies and crop variety that are foreign to the locals.

Mitigation measures

- Local people to adopt appropriate technology for crop and animal production.
- Preserve vegetative areas of cultural heritage.
- Synchronized celebration of cultural festive and agricultural production work related activities.

j) Increased child labour and workload for women

The baseline data, shows high dependency ratio among households. It also highlights child headed households and women headed households. Due to high poverty rates in the project area and job opportunities that will be created by the project, it is anticipated that more children will be forced to work in the farms providing family labour or hired for a fee to supplement household income. Cases of school dropouts and child pregnancies will be on the increase in the area. Based on the cultural gender roles and practices, more women will have increased burden of providing family farm labour alongside performing other household duties. This will have a long term impact on their health and availability of time to meet and exchange ideas.

Mitigation measure

- This will be controlled through enforcement of the Government policy on compulsory primary and secondary education, hiring people with national Identification Cards and promoting public awareness on gender roles.

7.4.4. Impacts and their mitigation measures during decommissioning phase

7.4.4.1. Positive impacts

The following positive impacts are associated with the proposed Project during thedecommissioning phase:

a) Rehabilitation

Upon decommissioning of the proposed Project, rehabilitation of the Project site will becarried out to restore the site to its original status or to a better state than it was originally. This will include replacement of topsoil and re-vegetation which will lead to improved visual quality of the area.

b) Employment opportunities

For demolition to take place properly and in good time, several people will be involved. As a result several employment opportunities will be created for the demolition staff during the decommissioning phase of the proposed Project.

At decommissioning phase, different activities will take place on the project. The design life of the project will be over and the project components will be rehabilitated or demolished. During decommissioning phase, the following activities will be carried out;

- Rehabilitation of site
- Rehabilitation of water supply
- Demolishing of site components
- Dismantling of machinery
- Disposal of waste generated during the process
- Demolition of vehicles operation
- Noise from vehicle operation

7.4.4.2. Negative impacts during decommissioning phase

The negative impacts associated with decommissioning are as described below;

a) Excessive Noise and Vibration;

Demolition works will involve movement of various heavy machinery which are anticipated to generate noise and vibration beyond the ambient level. This is anticipated to increase noise levels in the project area affecting particularly sensitive receptor areas such as schools or health facilities as renovation/demolition will be taking place on various project components.

Mitigation measures

- Excessive noise and vibration can be reduced if the following will be observed;
- Switching of vehicles and machines when not in use;
- Avoiding unnecessary hooting, insulate noisy machines and activities during operation to minimize noise impact to neighboring communities;
- Workers to be provided with personal protection equipment, machines and equipment to be fitted with silencer devices where possible;
- Warnings to be issued to the locals in case of any unusual noise;
- The noisy activities should restricted to daytime;
- The project proponent will ensure that NEMA noise and Vibration standards are observed in all project activities presented in baseline conditions.

b) Increase in waste generation.

During decommissioning, debris of various materials is expected and is expected to add more wastes into the environment. The effects of improperly waste management could be detrimental causing environmental pollution, nuisance to the local communities, and increased vermin among other undesirable effects. At baseline, the project area is poor in waste management as they burn unwanted wastes polluting the environment.

Mitigation measures

- Proper disposal of wastes generated at decommissioning phase.
- Recycling and re-use of waste where possible.

c) Air pollution

The demolition and renovation activities will lead to generation of dust, which affect the air conditions by increasing particulate matter in the air.

Mitigation;

- Watering of surfaces during decommissioning activities
- Ensuring that air quality standards highlighted in the baseline are adhered to

d) Occupation Health and safety

Occupation health concerns will be high in the project area during decommissioning phase of the project. Occupational risks expected during decommissioning phase include; Fire or explosions due to flammable materials in the pump houses, spillage of corrosive or hazardous substances, injuries and accidents sustained by workers, moving machine parts/equipment or falling materials and debris in excavated areas. Injuries and accidents sustained to workers as they use various kind of farm equipment and machinery for renovation/demolition.

Mitigation measures

- Ensure safety of the workers by putting first aid area and injury reporting mechanism
- Establish the appropriate safety measures in the O & M manual for the decommissioning phases.
- Ensure safety of residents by providing safety signs at strategic places around the access roads.
- Ensure compliance to Occupational Safety and Health Act Cap. 514 and its Subsidiary Legislations
- Provide personal protective equipment to workers
- There should be adequate provision of the requisite sanitation facilities for human waste disposal
- The workers should receive the requisite training especially on the operation of the machinery and equipment.
- Provide clean drinking water for the employees.
- Develop a site safety action plan detailing safety equipment to be used, emergency procedures, restriction on site, frequency and personnel responsible for safety inspections and controls.
- Recording of all injuries that occur on site in the incident register, corrective actions for their prevention are instigated as appropriate.
- Provision of prevention tools such as condoms at the health center and construction site availed to all

Summary of anticipated impacts

Table below summarizes the anticipated impacts and their magnitude right from the Project setting to decommissioning.

Table 6: Anticipated impacts and their magnitude

S/No.	Impacts	Activity/ area and pollutant source	Negative impacts		Positive Impacts		No Impacts
			Short Term	Long Term	Short Term	Long Term	
A	**Construction Phase**						
1	Employment opportunity	Skilled labour, unskilled and semi-skilled labour.			√		
2	Provision of market for supply of building materials	Making available the raw materials needed for construction of the proposed Project.			√		
3	Provision of market for food vendors and owners of the nearby business premises	Supply of food to the construction and purchase of items from the nearby business premises.			√		
6	Local increase of construction traffic	Transportation of construction materials to site and disposal of demolished material from site.	√				
7	Noise pollution and vibration	Use of compactors, vibrators and communication from construction workers.	√				
8	Occupational health and safety	Accidental fall, injuries from falling objects and hand tools etc.	√				
9	Impact on air quality	Emissions from DGs, SO2, NOX, SPM, CO, PM etc.	√				
10	Disposal of solid and liquid waste	Earth from excavations, food remains and waste water.	√				
11	Increased water demand	Water used for mixing of concrete and other construction works.	√				
12	Energy consumption	Use of manual labour, and fuel used in the DGs and other construction machines.	√				
13	Increased storm water runoff from new impervious areas	Storm water runoff from the pavements.	√				
14	Extraction and use of building materials and procurement	Extraction of sand, ballast, cement etc.	√				
15	Oil spills	From construction machines	√				

B	**Operation Phase**						
S/No.	**Impacts**	**Activity/ area and pollutant source**	**Negative impacts**		**Positive Impacts**		**No Impacts**
			Short Term	**Long Term**	**Short Term**	**Long Term**	
1	Employment opportunity	Skilled and semi-skilled labour, including security guard and landscapers.				√	
2	Optimal use of land and provision of aluminum products	Demolition of the existing building andconstruction of the factory				√	
3	Increase in revenue to government	Through tax paid.				√	
4	Increase aesthetic value of the surrounding area	Aesthetic of the area.				√	
5	Increased market to the industrial and business community	Purchase of aluminum products by the nearby industrial and business community.				√	
6	Solid waste generation	Industrial waste		√			
7	Energy consumption	KPLC main		√		√	
8	Increased water use	Industrial water use		√			
9	Disposal of waste water	Water for use in the cooling processes, and sanitation		√		√	
10	Increased storm water flow	Rainfall.		√			
C	**Decommissioning Phase**						
1	Rehabilitation	Landscaping or conversion of the areato other uses.				√	
2	Employment opportunities	Skilled, semi skilled and unskilled labour.			√		
3	Noise and vibration	Demolition activities.	√				
4	Solid waste generation	Demolition activities.	√				
5	Occupational health and safety impacts	Accidental fall, injuries from falling objects andhand tools, dusts emissions can lead to respiratory diseases.	√	√			
6	Reduction of industrial facilities	Demolition of industrial facilities		√			

CHAPTER 8
ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (EMP)

Introduction

Environmental management is an important aspect of project management and in protecting the environment. The objectives of environmental and social management plan is to ensure smooth implementation of environmental and social protection measures, mitigate adverse environmental impacts of project implementation, and ensure environmental and social protection activities are carried out smoothly in the project areas.

This proposed factory has been subjected to comprehensive environmental and social impacts assessment in accordance with prevailing environmental, laws and guidelines. Various potential adverse environmental and social impacts associated with the project have been identified and an ESMP formulated at the ESIA study stage to guide in mitigating the negative impacts. However, the implementation of some of the ESMP actions will require a response beyond the project level.

Where the expert team could not determine the realistic costs of some of the proposed environmental management activities due to the associated hidden costs, further actions will be proposed to come up with more accurate costs. It is upon the project proponent and the environmental enforcement agencies to ensure that the proposals are adhered to during the project implementation.

Table 7: Environmental management plan during construction phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Pre – construction (planning) phase				
Approvals				
Design	Ensure the project is designed by a competence, qualified and experience engineers in the field of sugar factories	Proponent	Designing / planning phase	300,000/=
Approval of the project	Ensure that the project is dully approved by all relevant government offices; NEMA, NCA, Physical Planning, public health, change of use	Proponent and contractor	Before construction	1,500,000/=
Change in land use	Subjected the land to change of use process hence its use will be changed from agricultural to industrial	Proponent	Before construction	100,000/=
Construction phase				
Environmental Degradation as a result of material sourcing (extraction)				
Materials sourcing : sand, ballast, timber, construction stones, e.t.c	Source material from facilities that area registered and have undergone satisfactory EIA / EA and approved.	Contractor	When sourcing material	As per BoQ
	Order for what will be required through accurate budgeting and estimation	Contractor	During project planning and preparation of BoQ	As per BoQ
	Reuse building materials as it will lead to reduction in the amount of raw materials extracted from natural resources	Contractor	Construction	Per cost

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Borrow pits	Must be subjected to EIA process and licensed	Contractor	Before extraction	50,000 per pit
	Burrow pits and quarries shall be located more than 50 meters from public infrastructure river, roads, school	Contractor	When sourcing for a site	0
	Cordon off the gravel site areas to keep livestock and children off;	Contractor	After acquisition and throughout until it is rehabilitated	100,000/ per site
	Prepare and implement burrow rehabilitation plans, which would minimise the risk of erosion;	Contractor	Decommissioning of the pit	As will be quantified
	The use of burrow pits for material spoil sites must be approved by NEMA and/or with the appropriate consent of the "landowner".	Contractor, proponent, land / site owner	Project construction	As will be agreed
Blasting hence causing safety and environmental risk	Obtain a current and valid blasting authorization from the Department of Mines and Geology.	Contractor	Prior to any blasting activity	20,000/=
	Only a qualified and registered blaster shall supervise blasting activities;	Blaster	All Blasting activities	Per contract
	Ensure that appropriate pre blast monitoring records are in place (i.e. photographic and inspection records of structures in close proximity to the blast area);	Blaster, proponent and contractor	Prior to blasting	0
	Have emergency services on standby	Contractor	Minimum of 24 hours prior to any blasting	During blasting

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Blasting hence causing safety and environmental risk (continuation)	• Undertake all safety measures to protect the workers and neighbours	Blaster	Prior and During blasting	As will be quantified
	• take necessary precautions to prevent damage to special features and the general environment,	Blaster and contractor	Prior and during blasting	-
	• Damage caused by blasting shall be repaired at the Contractor's expense to the satisfaction of the affected person and the relevant authorities;	Contractor	Immediately	Per damage cost
	• Give adequate warning and signals to the local communities	Blaster and contractor	immediately prior to all blasting	Per budget
Impact on biodiversity (fauna and flora)				
Clearing vegetation: resulting to reduced vegetation cover, increased erosion, pollution and siltation of nearby water bodies	Demarcate project site to restrict vegetation disturbance to project site to avoid spillover effects to neighboring plots.	Contractor and proponent	When securing the site	2,000,000/=
	Maintained at least 20% of the existing vegetation cover	Contractor	During ground clearing	0
	Locate project components where there are less vegetation to minimise on vegetation disturbance Control soil erosion to avoid siltation that may occur in the nearby river	Contractor	Ground setting and site planning	0
	Plant vegetation along the river bank as buffer zone	Proponent	Construction phase	1,000,000/=
	Project will leave at least 30m from the highest flood level of River Mugor as buffer / riparian zone	Proponent	During Site planning	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Traffic control				
Increased traffic hence resulting to accidents to the locals	Erect speed bumps to slow down speeding vehicles more so at the junction point;	Contractor	Shall be in place throughout construction period	30,000/=
	Signs shall be posted 100 meters before and after the junction to the site indicating vehicles turning area	Contractor		10,000/=
Disturbance to fauna; destruction of habitats, killing of wild animals & reduced grazing area for domestic animals	No killing of animals found on site	Contractor and his workers	Construction period	
	Maintain some vegetation cover that will be used by wild birds	Contractor and proponent	Ground setting and site planning	0
	Control soil erosion not to cause siltation that may lead to impacting on aquatic animals	Contractor	Throughout Construction period	200,000/=
	Give way to animals found crossing the road	Project vehicles (drivers)		0
	Liaise with KWS to relocate wild animals found on site	Contractor	During site clearing	0
Impacts as a result of Population increase				
Environmental disturbance and increased utilization & pressure on the available utilities	Maximize sourcing of employees from the local communities to reduce an influx of population from outside the area	Contractor	throughout construction period	0
Insecurity	Liaise with local administration to ensure that unwanted characters are not absorbed	Contractor	During employment	10,000/=
	Security will be enhanced in and around the project site	Contractor Security personnel & Police	Throughout construction phase	500,000/=
	Security agencies will be requested to beef up the current small police post in the area	Contractor and proponent	Throughout construction phase	-

Noise pollution and vibration				
Noise disturbance	Switching of vehicles and machines when not in use;	Machine operator	When not in use	0
	Avoiding unnecessary hooting,	Machine operator	Always	0
	Insulate noisy machines and activities	Contractor	Throughout	-
	Workers working in noisy areas to be provided with ear protective,	Contractor	Throughout	Per budget
	Purchase and use equipment designed with noise control elements.	Contractor	Always	Per market cost
	Machines to be promptly serviced	Contractor	When service is due	Per service cost
	The noisy activities should be restricted to daytime	Contractor, foreman	At specified time	0
	Ensure noise regulation standards are observed	Contractor and foreman	Always	Per statutory fee
Effect of vibration	Workers using drilling equipment to be provided with specialized anti-vibrating gloves,	Contractor	When handling drilling equipment	Per market cost
Health and safety				
Community health and safety measures	Have an insurance policy that covers the community in case of accident occurring out of site	Contractor	Throughout	Insurance policy
	Ensure safety of the community by providing safety signs and speed bumps at strategic places to avoid accidents	Contractor	Be in place always	50,000/=
	All the construction workers and everyone at the site must wear (PPEs)	Contractor, foreman, workers and visitor	Always	Per budget
	Reducing vehicle speed on project area to avoid occurrence of accidents	Drivers	When driving	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Occupational health and safety	Employ a health and safety officer	Contractor	During staff hiring	Per agreed cost
	Close supervision of work to prevent occurrence of accidents	Contractor / foreman	Throughout	0
	The contractor shall insure all his workers and community in case of accident occurring out of site	Contractor	Throughout	Insurance policy
	Instruct workers on safety and health issues to avoid occurrence of accident on site	Foreman	Daily basis	0
	Adherence to the occupational health and safety rules and regulations	Contractor and workers	construction phase	Per cost
Occupational health and safety (cont.)	Put up first aid area and injury reporting mechanism	Contractor	Be in place always	500,000/=
	use signs and marks to control traffic on site,	Contractor / foreman	Throughout	100,000/=
	Provide adequate sanitation facilities e.g toilets and bathrooms;	Contractor	Be in place always	100,000/=
	Provision of prevention tools such as condoms at the dispensary and washroom.	Health personnel	Always	10,000/=
	Only qualified and experienced persons shall operate machinery and equipment.	Drivers and foreman	Always	0
	Compliance to Occupational Safety and Health Act Cap. 514. Abstract to be pinned where it can be read	Everyone on site	Always	As will be quantified
	Recording of all injuries that occur on site in the incident register; and corrective actions be instigated as appropriate.	Foreman	When injury / incident occurs	Per the extent of the injury
	Develop a site safety action plan.	Contractor / health and safety personnel	When planning for construction works	20,000/=
	Provide clean drinking water for the employees.	Contractor	Always	2,000/= daily

Expected Negative Impacts		Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Pollution					
air pollution	Dust Emission	The access roads to be watered	Contractor	Thrice daily ;	-
		Limit the speed on dusty roads to 30km/hr;	Drivers	Always	0
		Construction to take the shortest time possible;	Contractor	Construction phase	0
		Workers to use masks when working in dusty conditions;	Foreman & workers	Always	50,000/=
		Using dust nets to trap dust at construction sites;	Foreman	Always	300,000/=
		Ensure dust levels do not surpass the NEMA standard highlighted in the chapter on baseline.	Project HSE in charge	Always	-
		Cover trucks hauling materials, dirt and debris	Drivers / operator	When transporting	0
		Applying water to at least 80% of all inactive accessible disturbed surface areas	Contractor / foreman	Daily when there is evidence of wind driven dust;	-
	Exhaust fumes	Construction vehicles to have catalytic devices to ensure complete burning of waste gases,	Contractor	Always	0
		Use of clean petroleum that is low in sulphur, lead or other pollutants,	Contractor	When fueling (procuring fuel)	Per cost
		Proper and prompt servicing of vehicles and construction machines	Drivers and project mechanics	When service is due	Per service cot
		Plant more vegetation for carbon sequestration	Contractor	Operation phase	40,000/=
		Vehicle idling time shall be minimized	Drivers	When idle	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Soil pollution: from poor waste management and Oil, fuel, grease and spillages	Ensure proper oil/fuel management as earlier on stated	Foreman / contractor	Always	0
	Ensure good waste management practice to prevent occurrence of leachate	Foreman / contractor	Always	0
Water pollution: Pollution of nearby rivers (River Mugor and Steti)	Ensure proper handling of loose soils during construction to prevent it from getting into storm water drain;	Foreman / contractor	When excavating	0
	Have adequate sanitation facilities that can treat waste water before releasing into the environment;	Contractor	Always	50,000/=
	Ensure recommended effluents standards are adhered to as per the provisions of EMC (water quality) regulation of 2006	Contractor	Contractor	50,000/=
	Ensure all vehicle repairs and services works are done at the contractors' yard to contain and manage oil/fuel spillages	Mechanics	When servicing vehicles / machineries	0
	Compact loose soils where works are complete	Foreman/ contractor	When the section is done	Per project cost
Reduced aesthetic value of the site and material extraction sites (barrow pit)				
Project site	Minimise on the excavations and ground disturbance	Contractor	During construction	0
	Proper containment and disposal of waste	Contractor	Throughout	0
	Maintaining some vegetation and planting more	Contractor	When site planning	20,000
Borrow pit	Reinstating the site (borrow pits);	Contractor	When pit is decommissioned	300,000

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Solid waste management				
Solid waste generation hence causing un-aesthetics view, pest breeding, unhygienic conditions, pollution of nearby rivers, air impairment and pollution of physical environment	There shall be no disposal of waste on the neighbouring plots without consent	Contractor	Throughout	0
	All waste shall be contained on site until they are collected for reuse or disposal	Contractor / foreman	Throughout	0
	Designate a waste collection point with segregation facilities	Contractor / foreman	Start of the project	300,000
	Provide material store for proper handling and storage of construction materials to reduce the amount of waste caused by exposure to the elements	Contractor / foreman	Throughout	0
	Purchase perishable materials incrementally to ensure reduced spoilage of unused materials	Contractor / foreman	When required	0
	Use materials that have minimal packaging to avoid the generation of excessive packaging waste	Contractor / foreman	During budgeting and purchase	Per budget
	Use materials containing recycled content when possible and in accordance with accepted standards.	Contractor / foreman	During budgeting and purchase	Per budget
	Reuse and recycle waste where applicable to reduce amount of waste to be disposed			
	Ensure materials are carefully budgeted to ensure that the amount of materials left on site after construction is kept minimal;	Contractor / foreman	During budgeting and purchase	Per budget
	Remaining waste shall be disposed at the county waste disposal site	Contractor	Periodically	300,000/=

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Water use				
Overutilization and miss use of water resulting to unwarranted pumping / abstraction hence high bill resulting to increased project cost.	Recycling and Re-use water	Foreman and workers	Throughout	0
	Construction workers to avoid irresponsible water use.	Foreman	Throughout	0
	Harvest rainwater and use in the construction activities;	Foreman	When it rain	50,00
	Use water saving taps;	Contractor	Always	Market cost
	Promptly detect and repair of water pipes and tank leaks; and	Contractor / foreman	Immediately when leakage/ bust occurs	Per repair cost
	Obtain water abstraction permit from WRA.	Contractor	Project planning	50,000/=
	No sourcing of water from community springs, well or water kiosk except for drinking purposes.	Contractor	Throughout	0
Storm water runoff				
Increased storm water runoff from new impervious areas	Leveling the Project site to reduce run-off velocity and increase infiltration of rain water into the soil.	Contractor	Throughout	Per market rate
	Minimize impervious area and use of detention and/or retention with graduated outlet control structures	Contractor	Throughout	0
	Provision of slit traps in storm water drains	Contractor	Throughout	0
	Construction waste and excavated soil shall be heaped / handle away from storm water drain	Foreman	Throughout	0
	Monitor energy use and set targets	foreman	Always	0
	Develop and implement energy management plan.	Contractor	At the start of construction works	20,000/=

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Energy use				
Overutilization and miss use of energy resulting to increased bill than what is budgeted for thereby increasing project cost	Use of solar energy for lighting more so at night.	Contractor	Throughout	Per market rate
	Ensure construction machinery are promptly and well serviced to ensure optimal fuel consumption	Contractor	When due for service	Per service cost
	Use energy-efficient construction machinery Ensure compliance with Energy Management Regulations of 2012.	Contractor	Always	-
	Maximize use of bolts in joineries instead of use of welding that requires use of electricity	Contractor and proponent	Construction phase	Per project budget
	Sensitize staff to switch off electrical equipment or appliances when not being used.	Foreman and machine operators, workers	Always	0
	Contractor shall monitor energy use and set targets	Contractor / foreman	Always	0
	Contractor will also develop energy management plan.	Contractor	At the start of construction works	20,000/=

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Oil and fuel				
spilled fuel and oil	Service and fuel machinery in specific areas designated for this purpose	Contractor	When servicing or fueling	0
	Prompt cleaning of oil and fuel spills	Mechanics/drivers	Throughout	0
	Proper disposal of clothing or rags contaminated with oil will also take place.	Contractor	Throughout	0
	Have container to contain drained used oil	Contractor	Start of work	5000/=
	Maintain and service machineries not to cause oil or fuel leakages	Foreman/ mechanic/ drivers	As will be scheduled	Per service cost
Used oil	Used oil shall be collected in a safe container that doesn't leak and in manner it will not spill over.	Mechanics	Immediately it is drained	0
	Used oil shall be reused on site or collected for disposal or reuse elsewhere	Mechanics	Throughout	0
	Used oil shall only be sold to a waste handler licensed by NEMA to handle such waste	Mechanic / contractor	Construction phase	0

Table 8: Environmental management plan during operation phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Operation phase				
Vegetation coverage				
Vegetation disturbance and coverage on site	The company to have a landscaping program that will ensure that the company is landscaped with trees, ornamental shrubs and lash grass to at least 10% vegetation coverage.	Proponent through in charge of environment	Maintained throughout	Budget of 300,000 yearly
	Parking area shall be well designated and marked; avoid parking on grass	Proponent through in charge of environment and drivers	Throughout	0
	Have signage's warning on parking or walking on grass			0
	Walk way / paths to be paved and movement to be restricted to the paths	Proponent through in charge of environment	Throughout	1,000,000
	Plant trees along the river banks (riparian zone) to be a buffer zone	in charge of environment	Be planted and maintained throughout	1,000,000/=
	There shall be no factory activity along the river bank (riparian zone) unless it is helping in conservation of the river bank and ecosystem	Proponent and in charge of environment	Always	0
	Designate and develop an area within the premise or outside to be developed as an arboretum	Proponent and in charge of environment in liaison with KFS and KWS	Immediately the factory starts operating	2,000,000/=
	Designate a recreational area & restrict its use to resting only.	in charge environment	Always	-

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
In the community	Sensitize farmers not to clear all trees on their farms to cultivate sugarcane but to keep some trees;	Agricultural Extension personnel	Start of the project	0
	Have a policy that will require that a sugarcane farmer must plant a given number of trees depending on his/her farm acreage	Proponent and in charge of environment	Always in place and implemented	0
	The company to have a tree nursery and also to partner with the local tree seedling producers to give farmers trees to plant on their farms. Trees must be those that survives and grown in the area	in charge of environment	Throughout	1,000,000/=
Food security				
Food insecurity as a result of farmers dedicating most of their land to sugarcane production at the expense of food crops	Organize workshops and seminars or visiting farmers on their farms to train and sensitize them on intercropping sugarcane with other crops including practicing pastoralism	Factory agricultural extension personnel	Beginning of the project and continued as will be programmed	2,000,000/=
	There will be strict adherence to the policy of farmers being allowed to cultivate not more than a third of their land with sugarcane, hence leaving not less than two third of the land other use including food crops farming, pastoralism	Farmers and Factory agricultural extension personnel to ensure compliance	Always	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Water use				
This project requires a large quantity of water in its processing and domestic use thereby increasing water demand in project area	Reuse Cooling water as they are safe	Processing System operators	Always	0
	In cane processing, Recycle process water by using closed loops system for intensive solid generating washings, (e.g. cane and beet wash) and flue gas scrubbers.			0
	Keeping the temperature of incoming water between 30^0 and 35^0 C can reduce losses due to evaporation.			0
	Recycling clarified water from ash settling pond and condensate tank overflow for cleaning purposes;			0
	Quick fixing of licking pipes	Factory plumber	When burst occurs	Per cost
	Sweep with a broom and pan where possible, rather than hose down external areas.	Cleaners	Always when cleaning	0
	Reduce water delivery in taps, through the installation of low flow devices	Factory plumber	Construction and maintenance phases	To be determined
	Use a manually pressed button flush valve which stops on release of button; and			
	Use water efficient plumbing fixtures to save water			
	Rain water harvesting should be taken into consideration to capture rain water and store.	Factory plumber	Construction phase and be in place always	1,000,000/=

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Liquid waste				
Waste water from processing section; millhouse, suphur and lime house, condensate washings, boilers, condensates, occasional spills and leak and periodical cleaning of processing section. Waste has high BOD, chemical, grease, oil, sugar and high temperature.	Design and construct water treatment plant capable to handle waste water from factory processing section	Proponent / contracted engineers	During project planning	0
	Maintain the waste treatment plant in good working condition	Factory foreman	Always be in good use	Per budget
	Ensure the effluent treatment plant is well operated and that proper monitoring takes place to make sure that the surrounding environment is not polluted.	Factory foreman	Always	0
	Operate the mill without overloading so that the evaporator and vacuum pan condensate is maintained clean to enable reused	Plant operators	Always	0
	Provide grease trap to eliminate grease and oil before the waste water is drained into the treatment system.	Factory foreman	construction phase	Per Construction budget
	Ensure the grease trap is maintained and cleaned		operation phase	Per operation budget
	Store molasses in RCC tanks or steel tanks raised above ground level to prevent ground water contamination. The high BOD of molasses may cause pollution problems due to mishandling.	Proponent / plant operators	Constructed during operation phase and maintained during operation phase	Construction budget and Operation budget
	Housekeeping measures such as monitoring oil spills, repair of leaking pumps, removing debris from canals to minimise the contend of pollutants in the waste water	Factory plumber and cleaners	maintenance phases	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Residuals from Wastewater Treatment Operations	Evaluate on a case-by-case basis to establish whether it constitutes a hazardous or a non-hazardous waste and managed accordingly; use as manure or deposed at the solid waste disposal site	Factory foreman	During plant periodical cleaning	As will be determined
Sanitary Wastewater : foul water from washrooms, kitchenette and from residential [staff quarters] section	These waste water will be treated differently from the processing / factory waste water;			
	Segregation of wastewater streams to ensure compatibility with selected treatment option (e.g. septic system and bio digester);	Proponent	System put up during construction phase	Construction budget
	Pretreatment of oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into sewer systems;	Factory foreman	Always in place during operation phase.	0
	Sludge from sanitary wastewater treatment systems should be disposed of by a licensed NEMA Registered Waste disposal management entity.	Contracted waste collector	During exhausting / cleaning of treatment system	Per contract sum

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Liquid waste monitoring				
Monitoring of the treatment of liquid waste to ensure that effluent discharged meets the require standard and doesn't cause pollution	There shall be a personnel designated / employed to man and operate the waste management system	**Proponent**	Immediately the factory starts operation	Employment policy
	Have a department / section handling water quality monitoring	**Proponent**	Operation phase	Per cost
	Have and located Effluent sampling at strategic upstream points and discharge point.	Factory environmentalist	Start of factory operation	100,000/=
	Sampling shall be conducted by or under the supervision of trained individuals.	Factory environmentalist	When collecting samples	0
	Analysis should be conducted by entities permitted or certified for this purpose.	Factory environmentalist	Every time samples are collected	Per analysis cost
	Sampling and Analysis Quality Assurance/Quality Control (QA/QC) plans should be prepared and, implemented. QA/QC documentation shall be included in monitoring reports.	Factory environmentalist	Factory environmentalist	0
	Comply with EMC (Water quality) Regulations 2006 by ✓ Having appropriate liquid waste treatment facility, ✓ Ensuring that the effluent discharged meet the set standards and ✓ Acquiring effluent discharge license	 Proponent Factory environmentalist Proponent	 Construction phase Operation phase Annually	 Construction cost 0 100,000/=

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Pollution due to Hazardous Materials Spills				
Hazardous materials spill may impacts to surface water, groundwater, and/or soil could result.	Develop a spill prevention plan.	Factory environmentalist	Start of operation	0
	Ensure that chemical containers are adequately labeled with illustration / instructions on its use safe handling or first aid measures	Factory environmentalist	Always	0
	Make spill clean-up equipment readily available in chemical storage areas.	Factory environmentalist	Always	100,000/=
	Ensure that chemical containers are stored in a safe fashion to reduce the potential for containers falling over and spilling.	Chemical handler / technician	Always	0
	Storage of fuels and other hazardous materials will be conducted in designated locations only	Factory environmentalist	Always	0
	Workers who handle chemicals will be provided training in chemical safety, spill management and prevention. They will also be provided with appropriate and adequate PPEs	Proponent, Factory environmentalist	Periodically	100,000/=
	Re-fuelling and maintenance of equipment will be conducted in designated (properly designed and constructed) locations only.	Fuel attendant, mechanics and Factory environmentalist	Always	0
	Provide emergency showers or eyewash stations in areas where some chemicals are handled	Factory environmentalist	In place always	20,000/=

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Waste management				
General solid waste	Ensure segregation of waste to promote the reuse, recycling, reduction and appropriated disposal waste management strategies	Factory environmentalist	Always	0
	Provide waste bins with segregation components at strategic points within the compound (factory and residential units)	Factory environmentalist	Start of operation and maintained always	500,000/=
	Metal waste will be sold to scrap metal dealers for recycling; Scrap metal council guidelines shall be adhered to;	Factory management & environmentalist	When enough to be disposed	0
	Waste collection points/facilities; skips and bins, shall be positioned in area not susceptible to storm water so that they are not carried by storm water to nearby surface water bodies;	Factory management & environmentalist	Operation phase	0
	Provided adequate litter collection facilities; dirt bins and skips, in all generation potential generation areas,	Factory management & environmentalist	When project is starting	500,000/=
	Have own waste disposal site approved by NEMA in accordance with the waste management regulations,	Factory management & environmentalist	During project planning	3,000,000/=
	Chemical and hazardous wastes should not be burnt or dumped in open pits. Provide incinerator for such waste or Contract waste collector who deals in such waste	Factory management & environmentalist	During construction	400,000/=
			During operation	Per contract
	The company through will ensure that canes are tightly loaded to avoid scatter or dropping (littering) when on transit.	Cane supervisors and truck drivers	During harvesting and transportation of canes	0
	The company will also partner with county department in charge of waste management to organize periodic cleanup activities (to help in cleaning the dropped / littered sugarcane wastes)	Factory management & environmentalist	Quarterly	100,000/= per activity

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
General solid waste (cont)	All contracted waste companies (those collecting waste for reuse/recycling i.e scrap metals, used tires e.t.c) must be in compliance with NEMA requirements as per waste management regulation of 2003 and county government laws. This will include having requisite permits, licenses and tracking documents.	Factory management & environmentalist	Always	0
	All company waste transportation vehicles must be licensed by NEMA	Factory management & environmentalist	Annually	Per NEMA fee
	Partner with county government in waste management, i.e by funding activities such as purchase of waste bins and skips to be located in nearby Shopping Centres and towns.	Factory management & environmentalist	Annually	Per drawn budget
Bagasse:	Bagasse will be stored in an area far from other factory activities; more so fire related activities	Factory environmentalist	Designation done during site planning	0
	Heaping section will be provided with lining to prevent leachate from percolating down the soil	Factory environmentalist	During construction and maintained throughout operation phase	2,000,000
	Heaping section will be provided with leachate drainage and containment/treatment lagoons / treatment system to ensure the leachate is treated before discharge.	Factory environmentalist		
	To minimise its amount, the company can sell the bagasse to those reusing it for briquette making and other re-users/ recyclers	Factory management	Anytime	0
Press Mud:	Press mud from double sulphitation process will be collected and used as fertilizer	Agricultural manager and Factory environmentalist	When generated	0
	Press mud from double carbonation process is disposed or used to land filling and is not used as manure.		When generated	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Emissions to Air				
Particulate Matter and Dust: exhaust gas from the boiler and normal dust from roads and earthen open places within the factory	The boiler to be designed to have particulate matter control (electrostatic precipitators), to capture the ash and recycle the water to prevent the emission of particulate;	Factory management & environmentalist	Always	Per project budget
	Use wet scrubbers to remove dust from drying and cooling of sugar;		Always	Per project budget
	Reduce fugitive dust from roads and areas within the factory by cleaning and maintaining a sufficient level of humidity;		Daily	To be determined on site
	Install ventilation systems with filters on transport systems for dry sugar and on sugar packing equipment.		Throughout	Per cost
Reduced Air Quality Due to Dust Generation during Bagasse Handling, Storage and Disposal	The company will develop a bagasse handling management plan to manage bagasse supply and demand to the boilers and to ensure bagasse quality is maintained during storage.	Factory operator and environmentalist	Plan be in place be implemented	100,000/=
	Repair leakages in bagasse & bagacillo chutes to reduce dust releases.	Factory operator	When there is leakage	Per repair cots
	Ensure an enclosed bagasse shed to keep the dust enclosed.	Factory operator	Start of the project	1,000,000/=
	Provide Personal Protective Equipment and training to personnel working directly with bagasse.	Factory management	Always	To be determined on site
Air Quality Deterioration Due to Fossil Fuel Emissions	Ensure that vehicles and equipment are inspected and maintained to prevent unnecessary increase in fuel consumption hence more exhaust emission.	Factory mechanics	When due for service and when faulty	Per service cost
	Vehicles and equipment will not be left idling when not in use.	Drivers	When not in use	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Agrochemical pollution: Increased use of aerosol chemicals to control pests and diseases as well as improving soil fertility in sugarcane farms will lead to air pollution.	Use of personal protection gears during spraying,	Farmers and factory agricultural extension officers to sensitize and train the community on safe use of aerosols	When spraying	Per market cost
	adoption of integrated pest management practices,		Always when farming	0
	planting of wind break vegetation such as trees		At Start of farming	Cost depending on acreage
	spraying of crops should be done on a calm day,		When spraying	0
	Strict following of manufacturer's directions when using agrochemicals		Always when using aerosol chemicals	0
Greenhouse gases	Provide farms with press mud to be used as manure	Management	Always	Per cost
	Avoiding biomass burning but instead use it for compost organic manure.	Farmer	When clearing the farm	0
	Apply crop residues or organic manure to dry fields to increase aerobic decomposition of the matter	Famer	When farming	0
	Practice agroforestry and intercropping by planting plants with high primary productivity for carbon sequestration.	Famer	Always	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Increased traffic				
Prevention and control of traffic related injuries and fatalities	Install speed bumps on the road to the site to slow down speeding vehicles	Factory management & environmentalist	Always	Per project budget
	Set up a common transport system for employees with a view to encourage mass transport;	Factory management	Always	0
	Emphasizing safety aspects among drivers Improving driving skills and requiring licensing of drivers	Management	Always	0
	Adopting limits for trip duration and arranging driver rosters to avoid overtiredness	Transport sector	Always	0
	Avoiding dangerous routes and times of day to reduce the risk of accidents	Drivers	Always	0
	Use of speed control devices (governors) on trucks, and remote monitoring of driver actions	Management /transport sector	Always	Per cost
	Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.	Management	When faulty	Per repair cost
	Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents	Management	Always	50,000/=
	Post signs 100 meters before and after the junction heading to the site and from the entrance of the factory indicating that vehicles may be turning off the road	Factory management/transport section	Immediately from construction phase and maintained through operation phase	20,000/=

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Fire hazards				
Potential source is bagasse and fires from the boiler, handling of explosive chemicals such as fuel, improper plumbing etc	Install Fire alarm system comprising of break glass call points, fire detectors, sirens and a control indicator panel will be installed in all sections within the factory and staff quarters	Factory management & fire management department	Put in place during project construction & maintained during operation	Per project construction budget
	Have Hose reels systems with a permanent connection to a pressurized			
	Put in place and strategically position adequate Portable firefighting equipment in compliance with the current standards			
	Fire exit signs will be placed at strategic locations in the building.			
	Have a retreat (fire assembly) point in case of a fire emergency	Fire department	Always to be in place	0
	Sprinklers and connection to pressured water supply to be installed in the bagasse shed to douse any fire outbreaks in this area	Fire department	During construction phase	Project budget
	Procedures to follow in case of fire will be displayed in strategic places to ensure safe and speedy evacuation of personnel and visitors.	Fire department	Always in place	200,000/=
	A fire escape must be provided with wide open escape routes to allow speedy exit in case of fire.	Fire department	Always	0
	The staff will be trained on fire fighting and fire drill and first aid.	Fire department	Periodically / annually	To be determined
	A 200,000 litres water tank connected to water sprinkler system will be constructed underground.	Factory management and fire department	During project construction phase	Per project budget
	All guidelines, norms, specifications and conditions likely to be imposed by the Government will be strictly complied with.	Fire department	Always	Per cost
	Have fire management and response department	Factory management	By start of project	Per factory budget

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Noise and vibration				
Sources: boiler, workshop, garage, at the control room and use of Machineries	Use equipment with lower sound levels	Management	Always	-
	Install suitable mufflers on engine exhausts and compressor components	Management	Always	-
	Install acoustic enclosures for equipment causing radiating noise	Management	Always	-
	Installing vibration isolation for mechanical equipment	Management	Always	-
	Limiting the hours of operation for specific pieces of equipment or operations and limiting the number of equipment operating simultaneously where the noise level exceeds ambient levels of 70 dB by more than 20 dB.	Machine operators	When operating	0
	Locate noisy equipment/operations sources to less sensitive areas	Management	During site planning	0
	Developing a mechanism to record and respond to noise complaints	Factory environmentalist	On occurrence	0
	Noise levels will be monitored and necessary actions taken to mitigate effect		semi-monthly	Per cost
	Equipment and vehicles will not be left idling for longer than 10 minutes at a time	Operators	When not on use	0
	Put in place clear warning signs indicating high level noise areas and emphasis of noise protection equipment	Management , Factory environmentalist	Always in place	0
	Provide hearing protection to staff working in noisy area	Management , Factory environmentalist	Always	Per operation budget

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Energy consumption				
Overutilization of energy resulting to overload on the national electricity grid and high electricity bill	The factory will produce its own electricity	Management	An year after operation	10,000,000
	Select the most efficient lighting system design for the required application in various stages of industrial processes;	Management	During operation	Per market cost
	Adopting the most effective lighting controls to ensure optimum operating efficiency and minimum energy wastage, e.g. central programmable time switches;	Management	During operation	Per market cost
	Install energy saving appliances e.g. energy saving bulbs;	Management / foreman	During operation	Per market cost
	Maximizing the contribution of daylight to reduce the use of artificial lighting	Everyone	Always	0
	Install solar lighting system more so for security lighting, street light and other uses	Management	During construction and maintained during operation phase	Construction and maintenance budgets
	Paint interior of buildings light color			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Health and safety				
	Employ occupational health and safety officer	Management	At start of project operation	Per company employment policy
	Health, Safety, and Environmental (HSE) Management Manual will be prepared to clearly define the responsibilities, procedures and proposals to be adhered to during	Factory health and safety officer	Project operation phase	100,000/=
	Establish a Health and Safety Committee	Management	Start of project	0
	Training employees on environmental health and safety and first Aid		Continuous process.	1,000,000/=
	Enforce compliance to Health, safety and environment policies and procedures;	All employees	Always	0
	Prepared and implemented Occupational health and Safety plans to enforce compliance with the regulations of the OHS Act 2007.	Factory health and safety officer	Start of Project operation	0
Physical hazards	Install catch platforms under conveyors that cross passageways or roadways;	Management	Project construction phase	Construction budget
	Ensure quickly cleanup of spills;	Operators	Immediately spillage occur	0
	Use non-skid walking surfaces that allow drainage;	Management	Always	
	Install guard rails on walkways adjacent to production lines or at height, and clearly mark traffic lanes for vehicles and pedestrians;	Management	During project construction	Project budget
	Equip mobile equipment with roll-over protection.	Management	Always	-
	Establish routines checkup to ensure that heavy loads are not moved by crane over personnel;	Operators	Always	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	Workers at site will be adequately provided with adequate and appropriate Personal Protective Equipment (PPE)	Management	Always must be worn	To be determined
	Provide adequate first aid kits placed at easily accessible points	Factory health and safety officer	Always	100,000/=
	The upper floors of the sugar mill must be fitted and equipped with chequered plate hand rails wherever possible	Management	During project construction	Construction budget
	All pipes should be colour coded and steam pipes will be properly installed and indicated where necessary	Operators	Operation phase	0
	OSHA Act and WIBA should be strictly adhered to	Management	Operation phase	Per required cost
	Have Public Liability Insurance in case of accidents to visitors	Management	Operation phase	Per insurance policy
Confined Spaces	Incorporate engineering measures to eliminate, to the degree feasible, the existence and adverse character of confined spaces.	Proponent	During designing and construction phase	Construction budget
	Confined space be provided with safety features that will enable venting, monitoring, and rescue operations, to the extent possible.	Management	During designing and construction phase	Construction budget
	The area adjoining an access to a confined space should provide ample room for emergency and rescue operation	Management	During designing and construction phase	0
Premise security	Installation of an entrance and exit security check.	Management	Operation phase	1,000,000/=
	Hire well trained security officers from a reputable company to patrol the premise	Management		Per contract
	Install an internal surveillance system that will monitor the plant at all times.			Market cost

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Community Health and Safety	Locating associated facilities such as worker camps close to project sites and arranging worker bus transport to minimizing external traffic and accidents	Management	Operation phase	Project budget
	Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or hospitals or other locations where children may be present. Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaigns)	Management	Operation phase	100,000/=
	There should be speed bumps on the road to slow down speeding vehicles hence reducing accidents and dust generation that may have health risk to the community and road users	Transport sector	Maintained always	100,000/=
	Signage will be posted within the project area and along the transportation route to warn people of large vehicle movement and turning as well as on increased traffic. Such signage will be clear and easily visible	Management	Always	0
	the company will undertake periodic monitoring and consultation with the local communities to identify any major impacts (including the emerging once) and implement appropriate mitigation measures	Management	Annually	Per budget

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Social impact				
Land use conflicts between pastoralists and farmers or between the community and the factory.	Train and sensitize farmers on ways to balance between farming and pastoralism	Factory Agricultural extension officers	Operation phase	0
	The company together with the local leadership will form a grievance redress mechanism to address issues that may arise.	Factory management & local leadership	Operation phase	50,000/=
Insecurity: Thugs/thieves hiding in the sugar plantations	Community to partner with local administration to ensure good security (community policing)	Community and local authority. Company to spearhead	Operation phase	100,000
	Putting up floodlights and street lights in risky areas	Management		Per contract
	Employ more police office at the police station in the area	Police department	From start of the project	-
Increased child labour and workload for women	Have field officers who will monitor farm activities to ensure that children are not involved in intensive farming activities (child labour)	Factory fields / agricultural officer Children officers, local administration, social and gender officer	Operation phase	0
	Enforcement of the Government policy on compulsory primary and secondary education,			0
	hiring people with national Identification Cards			0
	Promoting public awareness on gender roles.			50,000/=

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Break- up in families and HIV: practices polygamist by men due to increased income hence neglecting first family and spread of HIV as a result of prostitution	Form a farmers' cooperative society where famers will have their money banked and given in structured manner	Farmers and the company	Operation phase	0
	Conducting Social education on finances, investment, money banking, HIV/AIDs and effects of family break ups	The company	Operation phase (continuous periodically)	200,000 annually
	Construct a booths to be used as VCT Centres where the community can access to know their HIV statuses	The company	Operation phase	500,000/=
	Develop a comprehensive STDS, HIV and AIDs awareness and control program such as provision of condoms to workers both male and female	The company	Operation phase	100,000/= yearly
Rural- urban movements of people	Company to ensure centralized distribution of resources to minimize such movements	The company	Operation phase	To be determined
Gender based conflicts Maasai community women are not give equal opportunities as men in employment	sensitizing the community on the importance of gender equality	The company	Operation phase	50,000/=
Social cultural changes: project will attract people from outside the maasai community hence influence change of culture	Sensitize Local people to adopt appropriate technology for crop and animal production.	The company through extension officers	Operation phase	100,000/=
	Synchronized celebration of cultural festive and agricultural production work related activities.	The company	Operation phase	50,000/=
	Preserve vegetative areas of cultural heritage.	The company, local leaders	Operation phase	200,000/=

Table 9: Environmental management plan during decommissioning phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Demolition waste management				
Demolition waste	Use of an integrated solid waste management system i.e. through a hierarchy of options: Source reduction; Recycling; Reuse; Sanitary land filling.	Project Manager and Contractor	One-off	To be determined
	All structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible.	Project Manager and Contractor	One-off	-
	All foundations must be removed and recycled, reused or disposed of at a licensed disposal site.	Project Manager and Contractor	One-off	-
	Where recycling/reuse is not possible, the materials should be taken to a licensed waste disposal site.	Project Manager and Contractor	One-off	-
Rehabilitation of project site				
Vegetation disturbance	Implement an appropriate re-vegetation program to restore the site to its original status.	Project Manager and Contractor	One-off	-
	Consider use of indigenous plant species in re-vegetation.	Project Manager and Contractor	One-off	-
Minimization of occupational health and safety impacts				
Increased occupational health and safety risks	Adherence to the Occupational Health and Safety Rules and Regulations stipulated in the Occupational Safety and Health Act, 2007.	Health and Safety Manager	Throughout decommissioning period	To be determined

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Increased occupational health and safety risks (cont)	Provision of appropriate personal protective equipment as well as ensuring a safe and healthy environment for demolition workers.	Proponent	Throughout decommissioningperiod	To be determined
	Mitigate demolition workers accidents by enforcing adherence to safety proceduresand preparing contingency plan foraccident response.	Health and Safety Manager	Throughout decommissioningperiod	To be determined
Minimization of demolition noise and vibration				
Noise and vibration	Sensitize demolition vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Project Managerand Contractor	Throughout demolition period	No added cost
	Sensitize demolition drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, offices, hospitals,residential houses and schools.	Project Managerand Contractor	Throughout demolition period	No added cost
	The noisy construction works will beplanned to be during the day.	Project Managerand all site foreman	Throughout demolition period	No added cost
	Ensure that demolition machinery is kept in good condition to reduce noise andvibration generation.	Project Managerand Contractor	Throughout demolition period	To be determined
	Ensure that all generators and other equipment used are insulated or placed in enclosures.	Project Managerand Contractor	Throughout demolition period	To be determined

CHAPTER 9
CONCLUSION AND RECOMMENDATIONS

9.1. Conclusions

With regard to this sugar processing factory project, the following conclusions have been arrived at;
From the report, it is evident that the project is environmentally and socially acceptable with all the mitigation measures taken into consideration; Based on the positive side of the project, it will lead to job creation to locals improving their financial capability, improved sugarcane production, improved animal husbandry, power generation and will create avenue for value addition projects.

The project does not affect so many people while the benefits spread across larger community segments. Environmentally and socially, it can be concluded that the project is viable as the proposed project area has no recorded or known fragile ecosystem: the plants and animals identified in the study are spread across the region and are not unique to this ecosystem alone.

The local community has indicated their desire to have the factory project to be implemented without delay. The stakeholders have welcomed the project and they wish for quick implementation to improve people's livelihood. The site is acceptable to a majority of the local residents, most of whom appreciates the value it will have on the social and economic wellbeing of the area.

With implementation of the project following the ESMP provided, negative impacts shall be reduced to the minimum and maximizing on positive impacts.

9.2. Recommendation

Sensitization: The study on this Sugar Factory project recommends the following;
There is need to undertake capacity building and sensitization for the local communities so as to enable them to competitively exploit opportunities that arise from the project.

Implementation: It is recommended that the proposed project be implemented in compliance with all the relevant legislation and planning requirements of Kenya at all times. In line with this, the proponent and the contractor must take the legislative framework provided in this report into consideration, during and after the implementation of the project, as will be appropriate.

Adherence to ESMP: In addressing the environmental issues, the contractor and/or proponent must follow the mitigation guidelines provided under ESMP. This will ensure the Environmental and safety of the neighbouring communities. It is also recommended that an Environmental and safety officer should be stationed in the proposed project site, during construction and operation phases. The safety officer will make sure that all the workers follow the safety rules.

Annual Environmental Monitoring and Audit: During Construction phase, the Consultant and the Contractor is required to undertake Environmental Monitoring to ensure that the Construction is done in compliance with the provisions of the EIA License and during Operations. The proponent should undertake an environmental audit (EA) of the project, as required by the NEMA. This will ensure that the project does not lose track of its good environmental management record achieved during construction. This can be done by seeking the services of a Lead Environmental Consultant an agro-economist and asociologist.

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- The Electric Power (Electrical Installation Work) Rules, 2006
- The Energy Act, 2019

10.0. ANNEXES

10.1. Consultants Compliance
10.2. Terms of Reference (TOR) for Environmental and Social Impact Assessment Study (ESIA)
10.3. Sukari Industries Ltd Identification and Registration
10.4. Proposed factory designs and layout plans
10.5. Title Deeds for the location
10.6. Copy of Bill of Quantities for the proposed project
10.7. Photo log
10.8. Terms of Reference (ToR)
10.9. Public Consultation and stakeholders attendant list and minutes
10.10. Public participation notices
10.11. Public participation letter
10.12. **Public Consultation Questionnaires**