ENVIRONMENTAL AND SOCIAL IMPACT ASSESMENT STUDY REPORT

FOR THE PROPOSED SOIT SUGAR FACTORY ON PLOT L.R NO. TRANSMARA/OLOMISMIS/1690 AT ESAIE SUBLOCATION, OLOMISMIS LOCATION IN KILGORIS WARD, TRANSMARA WEST SUB COUNTY, NAROK COUNTY

GPs Location: Latitude: **0º 19‘17.22’’S*, Longitude:* 35º03’18.17” E**

<u>PROJECT PROPONENT</u>

SOIT SUGAR COMPANY LIMITED

P.O BOX 1314-20200

KERICHO

CERTIFICATION

This Environmental and Social Impact Assessment Study Report (ESIA) for the Proposed Soit Sugar Factory Project to be located on plot L.R No.Trans Mara/Olomismis/1690 at Esaie sublocation, Olomismis location in Kilgoris Ward, TransMara West Sub County, Narok County has been prepared in accordance with NEMA regulations under the guidance and supervision of a registered NEMA Lead Expert. It meets statutory provisions stipulated in EMCA 2015, the Legal Notice No. 32 and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019. We hereby certify that the details herein are correct and true to the best of our knowledge.

ESIA CONSULTANTS

Belexa Development Consultants
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Name: Mr. Benard Obara
Designation: EIA/EA Lead Expert Reg No. 2848

Signature:  **Date: Date: 3/3/2023**

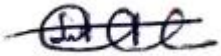
Associate Expert

Mr. Paul K. Muhia
NEMA Reg No. 10286

Signature  **Date: 3/3/2023**

PROPONENT

Name: Benard K. Soi

Signature:  **Date: 3/3/2023**

Designation: Director

On Behalf of: Soit Sugar Company Limited

P.O Box 1314– 20200

Kericho

PARTICIPATING EXPERTS

	Name	**POSITION/SPECIALIZATION**	**ROLE**
1.	Benard Obara	NEMA Lead Expert, Health and Safety Specialist Lead Expert Reg No. 2848 Belexa Development Consultants	Coordinated the overall EIA study activities, data collection, analysis, interpretation, and compilation of the final study results.
2.	Paul K. Muhia	Environment and Social Safeguards Expert Associate Expert Reg No. 10286 Belexa Development Consultants	Coordinated and participated in data collection, public consultation and report writing.
3.	Jacob Okal Ohalo	NEMA Lead Expert, Agricultural Specialist and a Sociologist Lead Expert Reg No. 11362	Guided in Collection of Baseline data and information, site visits, Public Participation and Stakeholder Consultation, As a social-safeguards expert he ensured the social aspects of the project are included
4.	Jermaine Omulami	Air Quality Expert CSI International Limited	Undertook required sampling and analysis of baseline data through NEMA accredited labs (Air quality, water quality etc)
5.	Kaguru Brian Otieno	Sociologist Associate Expert Reg No. 10286	As a sociologist to ensure the social aspects of the project were taken care of. Data collection, conducting public participation, Report writing
6	Moses K. Changwony	Director and Lead Consultant-MK Changwony & Associates	Produced and guided on information from feasibility studies, Designs and financial proposals conducted by his company Convened, chaired and participated in all public and stakeholders' engagement forums. Also, in charge of GIS mapping for the project.

ACKNOWLEDGEMENT

Belexa Development Consultants wishes to thank proponents of the proposed Soit Sugar Factory specifically Mr. Benard Soi, Mr. Alfred Soi and Mr. Stanley Soi among others who commissioned this ESIA. We are highly indebted to the area MCA of Kilgoris ward Mr. Leina Morintat who sacrificed his time to attend the Public and Stakeholder's meetings and even helped in stakeholders' mobilization. We also wish to thank all the stakeholders and other local leaders for their input, the area chiefs for support for their immense assistance in mobilizing participants. We express our gratitude to the general public and members of Olmismis community. Finally, appreciate the entire team of Belexa Development, MK Changwony & Associates and all Consultants who participated in conducting this ESIA Report by providing necessary assistance, information and relevant documentation including feasibility studies.

LIST OF ACRONYMS.

CBD Convention on Biodiversity
CBO Community Based Organizations
CCP Captive Cogeneration Plant
CDM Cleaner Development Mechanism
CITES Convention on International Trade on Endangered Species
CPP Captive Power Plant
EA Environmental Audit
EHS Environmental Health and Safety
EIA Environmental Impact Assessment
EMCA Environmental Management and Coordination Act 1999
EMP Environmental Management Plan
EMS Environmental Management Systems
ESA Ecologically Sensitive Areas
ETP Effluent Treatment Plant
EU European Union
FAO Food and Agriculture Organization
HIV Human Immune Virus
IRPTC International Register for Potentially Toxic Chemicals
KP Kenya Power
KWS Kenya Wildlife Service
MOH Medical Officer of Health
MW Mega Watt
NEAP National Environmental Action Plan
NEC National Environmental Council
NEMA National Environmental Management Authority
NET National Environment Tribunal
NETF National Environment Trust Fund
NGO Non-Governmental Organizations
PCC Public Complaints Committee
R.O Reverse Osmosis
SSCL Soit Sugar Company Limited
SEA Sexual Exploitation and Abuse
SERC Standards and Enforcement Review Committee
SOP Standard Operating Procedures
SPM Suspended Particulate Matter
TCD Tonnes Crushed per Day
TCH Tonnes Crushed per Hour
TOR Terms of Reference
UNEP United National Environment Program
WRA Water Resources Authority
MT Metric Tones
VMGs Vulnerable and Marginalized Groups

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EXECUTIVE SUMMARY

Background

This Environmental and Social Impact Assessment study was undertaken pursuant to the requirements stipulated by the National Environmental Management Authority (NEMA) under the Environmental Management and Coordination (amendment) Act (2015) that requires all proposed development projects listed under Schedule II of the EMCA, to undergo an Environmental Impact Assessment Study to determine the potential adverse impacts of a project and thereby devising appropriate mitigation measures. The study assesses the impacts of the proposed development and proposes mitigation measures as well as an Environmental Management Plan (EMP). It was carried out through desk research, field visits, and consultations. The team conducted extensive literature review including information sourced from the internet, in relation to the proposed project. During field investigations, information on physical, ecological and socio-economic aspects of the project area and its environs were determined.

This study constitutes the Environmental and Social Impact Assessment (ESIA) for the proposed sugar milling factory with a crushing capacity of 1250 TCD (expandable to 2500 TCD) on Plot No. Trans Mara/Olomismis/1690 measuring 23.640 Ha. It is found in Esaie sublocation, Olomismis location, Kilgoris ward, Transmara West subcounty, Narok county.

The Proponent is expected to engage in the activities of sugarcane procurement, milling of sugarcane, production of mill light brown sugar and marketing of the finished products.

Purpose of study

The purpose of this study is to ensure adequate identification of potentially positive and negative environmental and social impacts associated with the establishment of Soit Sugar Compaly Limited (SSCL) sugar factory in the area. Secondly, to propose workable mitigation measures, and thirdly to formulate an Environmental and Social Management and Monitoring Plan articulating envisaged impacts and mitigations, and to obtain an Environmental Impact Assessment license prior to commencement of the project.

Methodology

Site visits were undertaken in March 2023 for purposes of reconnaissance, assessing the baseline and environmental risks associated with the proposed project as well as applicable

environmental safeguards and standards. Environmental screening criteria was informed by the Second Schedule of the Environmental Management and Coordination (Impact Assessment and Audit) Regulations, 2003. As per this Schedule the issues considered by the experts were ecological and socio-economic issues, landscape changes, land use character and water aspects. Data collection methods included literature review, observations during site visits and photography. Stakeholders and public consultations were conducted with the community neighboring the proposed project site, relevant stakeholders and the proponent in two major public participation forums held at the proposed site in Esaie sublocation and another one in Olengoloto primary school in Olengoloto sublocation on **9th March 2023** and **17th March 2023)** *(Copies of attendance lists and minutes are annexed)***.**

The Project proponent provided the proposed project design details including feasibility study, proposed designs, Bills of Quantities (BoQ), Land ownership, registration certificate among other documents. The data collection was carried out through structured questionnaires where 50 questionnaires and 38 questionnaires respectively which were filled and returned in the two major forums.

Baseline environmental data was collected on ambient air and water quality in collaboration with Imara analytical laboratories and CSI International limited.

Involvement of Key stakeholders

Interviews were conducted to key informants including the area MCA, the area chief, village elders and lead sugarcane farmers in the area. A meeting for the Key stakeholder's engagement was also organized at Mara Frontier Hotel in Narok town on **22nd March 2023**. Stakeholders engaged included heads of departments from the County Government of Narok, WRA, Ministry of Agriculture (MOA), NEMA, DOSHs, Public Health, Roads and Trade. Two Members of County Assembly representing the county assembly of Narok were also present. The stakeholders' meeting was chaired by the CECM in charge of agriculture. The meeting provided very key information and concerns that have been incorporated in this study report in Chapter 5.

Potential negative impacts and mitigation measures during construction, operation and decommissioning of the proposed Soit Sugar factory were taken into consideration during the study and public/stakeholders' engagement.

Current site status and land use

Partially, the proposed site is currently under sugarcane plantation. The land will be converted into its intended use once necessary approvals have been acquired. There are however few homesteads scattered in the neighborhood but most are located far from the proposed project site. A barbed wire fence had been erected around the project site. Neighboring the site is natural vegetation that has been conserved from human disturbance and majorly for livestock grazing.

ESIA Process, Approach and Methodology

The general steps followed during the assessment included: -

- Environment screening, during which the proposed sugar factory project was identified as among those listed and requiring to be subjected to the ESIA process as stipulated in EMCA 1999 (Revised 2015) and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019 as stipulated in the Legal Notice No. 31 and 32.
- Submission of TOR to NEMA Headquarters for Approval
- Environmental scoping that provided the key environmental issues to be considered,
- Desktop studies and documentary review of relevant reports, legal, institutional and policy frameworks,
- Physical inspection and assessment of the proposed factory site,
- Analysis of project alternative options,
- In-house consultative meetings with the proponent (Directors of Soit Sugar Company Limited),
- Comprehensive baseline field environmental assessment,
- Intensive stakeholder engagement and public consultations,
- Comprehensive project impact analysis,
- Impact mitigation planning,
- Environmental management planning and preparation of an ESMP,
- ESIA report writing.

Status of Land Ownership

The sugar factory, to be located on Plot L.R No. Trans Mara/Olomismis/1690 measuring 23.640 Ha on registry map sheet No. 4. The land for the proposed sugar factory development was acquired from the registered owner Mr. Gideon Kiputa (See title deed attached) who has

agreed to sale the land to Soit Sugar Company. The proponent has enough land and has in total acquired land area of approximately 60 acres in anticipation of future expansion.

Project Objectives

The project objectives include the installation of a 1250 TCD sugar milling factory (Expandable to 2500 TCD) and 3 MW Captive Power. Mill white/mill brown sugar production from the initial Installed plant capacity of 1250TCD will be about 138 MT/day 3250 MT/month.

The operational phase of the project will involve the production of mill brown sugar with bagasse and molasses being produced as by products. Other by-products will include filter mud and boiler ash. Main inputs will be sugarcane, water, bagasse and electricity.

The by-products generated from the sugar plant, such as bagasse will be utilized in the mill and co-gen power plants and also excess of it can eventually be used to make paper or chip boards (expansion into other industry).

The Out growers targeted by the proposed sugar factory will be expected to fall mainly within 15 km radius of the factory area and will cover mainly Kilgoris.

Capital Cost Estimate

Factory design is as provided by Saisidha Sugar Equipments & Engineering Company the selected EPC contractor and the cost estimate will be as specified below.

From the Bills of quantities, the estimated total cost of setting up the factory is **1.508 billion Kenyan shillings** (or **Ksh. 1,508,365,987)**. The statutory charge of 0.1% processing fee payable to NEMA is therefore **Ksh. 1,508,365 (One million, five hundred and eight thousand, three hundred and sixty five shillings.** The payment is done on the e-citizen platform after receipt of an invoice from NEMA.

Baseline Environmental Status

The proposed project is situated within Narok County in Transmara West Sub-County. However, the environmental details were collected from a radius of 15 Km of the project site. A financial and feasibility study has been carried out.

The baseline water sample was collected from Olchoro lentim dam and spring water and analyzed as part of this study and indicated that most of the parameters are within the normal range for use. The water will however be treated at the factory to meet all other standards for

the parameters that were beyond the standards. *(source: baseline water sampling and analysis report for the proposed Soit Sugar Factory).*

Legislative and Environmental Setting

Various Laws and regulatory policies have been established by the relevant authorities for the control and regulations of sugar processing factories. These are considered and elaborated on the ESIA Study Report.

The proponent is advised to acquaint himself with the various Acts and regulations and adhere to them in the construction and operations phase of this project.

Prediction of Impacts

The assessment showed that the proposed sugar factory will have both positive and negative environmental and social impacts. The positive impacts are socio-economic in nature and include meeting the domestic demand for sugar in the Country, contribution of the project towards attainment of Vision 2030, provision of market for sugarcane and consequently income to local farmers, provision of employment opportunities, income to the proponent, market for local goods and services, source of raw materials for other industrial establishments (i.e molasses and bagasse), improved road network, corporate social responsibility (CSR), increased industrial development in Narok County and revenue to the government.

The negative impacts including clearance of vegetation, sources of air pollution, water pollution and solid waste generation are identified and the impacts due to the above are superimposed on the existing baseline environment. Impacts such as fire hazards, increase in population and traffic, ambient noise, drainages and storm water management, air emissions, security, environmental health and safety and occupational health and considered and measures to reduce and mitigate them are provided for in the Study Report.

Key potential negative impacts and recommended mitigation strategies

The project will experience some level of negative throughout the project cycle i.e., construction, operational and decommissioning phases. At the construction phase, the negative impacts will include water demand and effluent generation, solid waste generation and management, environmental risks of obtaining raw materials, destruction of the physical environment, occupational safety and health risks, air pollution, noise pollution and increased energy demand.

Site preparatory and construction activities will generate significant quantities of solid waste in form of biomass, overburden, domestic waste such as plastic containers and construction materials such as wood, building blocks, metal cuttings and wrappings among others. The proponent will procure the services of a NEMA licensed waste handler to dispose off the solid waste and ensure compliance with the provisions of the Environmental Management and Coordination (Waste Management) Regulations, 2006.

Clearance of vegetation will happen to pave way for the project. The proponent should retain vegetation cover in areas that will not be excavated as far as practicable. Replant indigenous trees in the section of the property that will not be developed to compensate for loss at construction phase

Construction activities will involve excavations works and clearance of vegetation cover. The proponent will put in place mitigation measures including retaining vegetation cover in areas that will not be excavated as far as practicable, compact loose soil within the project sites, use the overburden generated during construction activity to backfill the adjacent eroded areas and replant indigenous trees in the sections of the project that will not be developed to compensate for loss at construction phase.

Increased water demand and effluent generation during construction phase will be mitigated by sensitizing workers on need to conserve available water, installing bio-digester in place of soak pits and ensuring compliance with the provisions of Environmental Management and Coordination (Water Quality) Regulations, 2006

Environmental risks of obtaining raw materials will be mitigated by sourcing materials from licensed sites and ensuring procurement of materials is based on a Bill of Quantities prepared by a Quantity Surveyor to avoid potential oversupply of materials and wastage and maximize the re-use of construction waste materials.

The potential health and safety risks will be from the use of machinery, falling objects or even falls, air and noise pollution. These risks have a potential to cause disturbances, injuries, permanent disability or even death. The proponent should register the site as a workplace with the Directorate of Occupational Safety and Health Services (DOSHS), obtain insurance cover for the workforce, provide and enforce the use of Personal Protective Equipment (PPE), provide the correct equipment for the jobs assigned and train the employees on their use, ensure moving parts of machines and sharp surfaces are securely protected with guards to avoid

unnecessary contacts and injuries, provide first aid services and emergency vehicle at the site, regulate the entry of visitors to the construction site by deploying adequate security measures and comply with the provisions of the Occupational Safety and Health Act (OSHA), 2007.

Air pollution during the construction phase will be in form of dust and particulate matter generated during excavations, concrete mixing activities and exhaust fumes from machinery use and Heavy Commercial Vehicles (HCVs) delivering construction materials to the site. The proponent should mitigate this impact by ensuring dust screens are installed around the project site, water sprinkled to suppress dust, stock piles of construction materials covered, adequate dust masks provided and enforcing their use as well as monitoring fugitive emissions to ensure compliance with limits set under the First Schedule of the Environmental Management and Coordination (Air Quality) Regulations, 2014.

The proposed mitigation measures against noise pollution will include delivery of raw materials, excavation and construction work be limited to day time hours only between 8am to 5pm, locate machinery that are likely to produce noise as far as practical from neighboring properties, procure, provide and enforce the use of earmuffs, sensitize truck drivers to avoid unnecessary hooting and running of vehicle engines and ensure compliance with provisions of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

Operational phase impacts will include air and noise pollution, solid waste generation and management, increased water demand, effluent generation and management, occupational safety and health risks, community safety and health risks, fire risks and emergency, oil spills and increased energy demand.

Air pollution will mainly result in form of dusts and particulate matter emissions from stored bagasse during windy conditions, flue gases during combustion of bagasse in the boiler, juice treatment and evaporation process, exhaust fumes from machinery and vehicles accessing the facility and odor from the Effluent Treatment Plant (ETP). Mitigating the impacts of air pollution will involve planting fast growing trees along the boundary walls, installing dust screens around bagasse storage area, ensuring timely renewal of emissions license from NEMA, installing dust collectors and scrubbers within the plant and compliance with the provisions of Environmental Management and Coordination (Air Quality) Regulations, 2014.

Sources of noise pollution will include machineries during sugar production, vehicular movement in and out of the facility, loading and offloading activities and at the workshops. The excess noise levels may lead to hearing impairments to workers, visitors to the site and neighbors. The proponent should procure and provide adequate earmuffs to employees working at peak noise producing areas and enforce on their use, reduce the working hours for employees working at peak noise producing areas compared to those working in other areas, provide equipment that are properly fitted with noise reduction devices, service mechanical equipment regularly, undertake noise level monitoring through a NEMA designated laboratory and comply with provisions of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution (Control)) Regulations, 2009.

Solid waste generated during operation phase will include molasses, bagasse, fly ash and filter mud from the production process, paper, plastics, cartons, wrapping and organic wastes, used oil containers, and waste tyres and scrap metal from the workshops, and sludge from the ETP. Poor disposal of solid waste degrades environmental quality, may harbor disease causing pathogens and cause eye irritation. The proponent should therefore construct additional bagasse storage area to cater for the increased bagasse produced, amend the contractual agreement with the NEMA licensed solid waste handler to include disposal of the excess bagasse, sell of scrap metals and tyres to licensed recyclers and compliance with the provisions of the Environmental Management and Coordination (Waste Management) Regulations, 2006.

Waste water will be managed through constructing an Effluent Treatment Plant (ETP). The proponent will carry out regular inspection and maintenance of the ETPs, monitor quality of wastewater discharged from ETPs, ensure timely renewal of Effluent Discharge License and comply with the provisions of Environmental Management and Coordination (Water Quality) Regulations, 2006.

Water will be required for industrial and domestic purposes at various sections of the sugar mills. SSCL will source its water from drilling a borehole and will be supplemented by nearby dam. From the ground water potential mapping conducted during baseline studies, the area has very high potential for ground water and a proposal has been put in place to dig a dam for factory use and also to be shared by the community. The management has undertaken water quality sampling and analysis from the nearby spring and dam. valid water abstraction permits from Water Resources Authority (WRA) will be obtained for the water works and borehole drilling. Mitigation measures for water conservation will include installation of water saving

systems, carrying out regular inspection and maintenance of water pipes and ensuring compliance with the provisions of Environmental Management and Coordination (Water Quality) Regulations, 2006 and the Water Act, 2016.

Safety and health risks shall be mitigated by ensuring provisions of appropriate Personal Protective Equipment (PPEs) to workers, putting in place an effective emergency response plan, displaying signage warning of potential hazards at various sections of the plant, obtaining insurance cover for the workers -Work Injury Benefits Act (WIBA), 2007 and compliance with provisions of Occupational Safety and Health (OSHA), 2007.

Energy to run the sugar mill will be sourced from the cogeneration plant, National Grid and standby generators.

To minimize energy usage, the proponent will procure modern plant machinery, adopt renewable sources of energy to power the lighting systems in areas such as offices, install compact fluorescent lights in high use areas within the facility, keep records of power consumption to inform substantial practical guidelines for opportunities in energy efficiency, create awareness on energy consumption and carry out annual energy audits.

Decommissioning of the project can happen in the event of end of project life, closure of the plant by government agencies due to non-compliance with environmental and health regulations, an order by a court of law due to non-compliance with existing regulations, natural calamities and change of user of land. Key environmental and social concerns at this phase will be economic decline, safety and health risks, waste generation and insecurity. To mitigate the impacts, the proponent will prepare and submit a due diligence decommissioning audit report to NEMA for approval at least three (3) months in advance.

Table 1 below is an impact matrix highlighting the summary of impacts anticipated and action needed.

ENVIRONMENTAL & SOCIAL IMPACT	**NATURE OF TYPE**								**ACTION/MITIGATION**	
	Positive		**Negative**							
	Significant	Not Significant	Significant	Not Significant	Short Term	Long Term	Irreversible	Cumulative	No mitigation	Mitigation required
CONSTRUCTION PHASE IMPACTS										

Noise from construction activities			x		x					x
Air quality degradation			x		x					x
Oil Spillage			x		x					x
Risk of fire outbreak			x		x					x
Construction works induced traffic			X		x					x
Soil erosion				x	x					x
Accumulation of solid waste			X		x					x
Demand for water-depletion			x		x			x		x
Loss of terrestrial habitat & biodiversity				x	x					x
Materials stockpiling & storage				x	x			x		x
increased run off.			x			x				x
Contamination from sewage & litter			x		x					x
Soils & water contamination from spills				x	x					x
Littering from food vendors				x	x			x		x
Visual impact				x	x					x
Health and Safety				x	x					x
Employment issues	x				x			x	x	
Improved growth of economy	x					x		x	x	
Improved land value	x					x		x	x	
OPERATION PHASE IMPACTS										
	Positive		**Negative**							
	Significant	Not	Significant Significant	Not Significant	Short Term	Long Term	Irreversible	Cumulative	No mitigatio	Mitigation required
Water abstraction and associated pressure on existing sources			x			x		x		x
Pollution Control										
Accidental Oil Spills				x		x		x		x

Environmental degradation				x		x		x		x
Soil Disturbance				x		x				x
Bagasse, filter mud			x			x				x
Water contamination			x			x				x
Air pollution			x			x				x
Noise			x			x				x
Environmental degradation			x		x					x
Increased traffic – unnecessary congestion				x		x				x
Drain blockages				x		x				x
Vector and rodents breeding – Increased vulnerability to diseases				x		x		x		x
Electricity consumption – pressure on supply			x			x				x
Social amenities – Cultural interference				x						x
Increase in sugar production capacity	x					x			x	
Employment opportunities	x					x		x	x	
Optimal use of land	x					x			x	

DECOMMISSIONING PHASE

	Positive		**Negative**							
	Significant	Not Significant	Significant	Not Significant	Short Term	Long Term	Irreversible	Cumulative	No mitigation required	Mitigation required
Solid Waste generation			X		X					X
Dust			X		X					X
Noise & vibration			X		X					X
Rehabilitation	X					X			X	
Employment opportunities	X				X				X	

Environmental and Social Management Plan (ESMP)

Environmental and Social Management Plan includes the protection, mitigation and enhancement measures to be implemented to reduce the adverse impact on the environment as well as social impacts. The ESMP will be a baseline document that will be utilized in the management of the environment during the construction phase, the operational phase and the decommissioning phase. Its purpose is to ensure the sustainable use of the environment and it takes into consideration mitigation measures indicated in the above chapter and provides responsibilities and approximate costs. It is important that the proponent include this within his operating budgets from the outset in order to comply with the requirements of the Law.

Conclusion

The project will play an important role in the local, county and national economy. Constant monitoring of the said aspects (impacts and mitigation) through close follow-up and implementation of the recommended Environmental Management and Monitoring Plans will also ensure its longevity and avoid conflicts between the project and stakeholders or between it and the natural world. In relation to the proposed mitigation and environmental management and planning measures that will be incorporated during construction and operation phases; and the developments' input to the proponent and the general society, the proposed project is considered beneficial and important and the experts recommend it for approval. Major concerns should nevertheless be focused towards minimizing the occurrence of impacts that would degrade the general environment through follow up Environmental Audit which should be done annually just to cross check conformity and adherence to the regulations and recommendations made in this report.

CHAPTER ONE
INTRODUCTION

1.0 Project Overview

Soit Sugar Factory has been proposed to be developed and located on Plot L.R No.Trans Mara/Olomismis/1690 measuring 23.640 Ha at Olomismis ward in Kilgoris Sub County, Narok County. The company is owned by the Directors of West Valley Sugar Factory and others namely; Mr. Benard K. Soi, Alfred K. Soi, Brenda C. Soi, Brian K Soi, Stanley Kipkirui, Florence Chemutai and Lenah Chesang Kiprop (CR12 annexed).

The proprietors are Kenyan investors with interests in sugar farming, construction, retail and commodity trading. These investors have taken this investment decision to make a contribution to Kenya's Sugar Sector through: reduction of Kenya's dependence on imported sugar, creation of market for excess cane in TransMara West Sugar belt (a region with a significant potential for expansion of cane development and currently underserved by existing sugar mills).

The company has identified a gap in the crushing capacities of nearby sugar factories, the consequence of which has caused suffering among cane farmers in the region with most farmers claiming their sugarcane has been taking up to four years in the farm causing them unnecessary losses. In this view, with farmer targeted investment in mind, the directors of Soit sugar company have proposed to install a 1250 TCD plant to produce sugar with sufficient captive power.

1.1 Background and Rational of the ESIA Study Report

The proponent wishes to establish a sugar mill at the project site which hitherto has been agricultural. The company will encourage the community living in Olomismis and the larger Kilgoris to invest in sugar cane farming and will assist them with farming requirements. Once the factory is set up, the area which was noted to have challenges in accessibility due to poor roads will become an industrial growth center. This is an activity out of character with its surroundings at the proposed location and the land will have to go through change of user from agricultural land to industrial use. The project is included in the projects in Schedule 2 of the EMCA (Amendment 2015) that require an Environmental Impact Assessment. The proponent in compliance has therefore contracted EIA Experts to carry out this study report.

1.2 The Need for ESIA

The proposed project falls under the EIA mandatory activities and is among those listed and requiring to be subjected to the EIA process as stipulated in EMCA 1999 (Revised 2015) and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019 as stipulated in the Legal Notice No. 31 and 32. The project factory constitutes a major change in land use, and will establish an industrial estate, the project will also emit raw effluent that requires careful handling through proper ETP. Also anticipated is bagasse, a solid waste that is difficult to dispose off. The project will also result in air pollution which must be mitigated properly. All these have been addressed in this ESIA study report and proper mitigation measures to the impacts provided.

1.3 Objectives of the ESIA

The main objective in respect to the proposed Soit sugar factory is to guide environmentally sound decision-making. Such a decision will be on the basis of significant environmental impacts related to the project. Mitigation measures proposed will determine whether the decision to implement the project will be deferred or approved.

Specific broad objectives shall include:

i. Identification; examination and analysis of all the significant environmental and socio-economic impacts related to the proposed Sugar Factory project.
ii. Carrying out baseline surveys of the existing environmental, social and economic parameters in the project area upon which the ESIA Study is based.
iii. Identifying, examining and analyzing existing policies and institutional arrangements for effective implementation of the proposed project.
iv. Analyzing specific project alternatives in terms of site, technology, design, scale, size and extent.
v. Formulating workable, acceptable and viable environmental mitigation measures to minimize identified negative impacts.
vi. Developing an ESMP specifying specific actions, responsibilities, time schedule and costs.
vii. Making appropriate conclusions and recommendations.
viii. Ensuring adequate consultation and public participation throughout the ESIA process.

1.4 ESIA Process and Approach

The ESIA process identifies significant negative and positive environmental impacts and proposes mitigation measures to ameliorate negative impacts. The process also provides a mechanism for auditing and monitoring and implementation of mitigation measures contained in the Environmental and Social Management Plan (EMSP).

The key steps on EIA process include:

1.4.1 Screening

This project was screened and a decision was made in reference to the NEMA Public Notice on ESIA and Legal Notice No 31 and 32 of April 2019 that the report is high risk and thus requiring to undergo full study and submitted to NEMA headquarters.

1.4.2 Scoping

Site visits were made by the experts together with the representatives of SSCL, the area MCA, the chiefs and members of the public. This was done to ensure that critical issues pertaining to the ESIA were identified to enable the experts understand the area and collect baseline information in preparation for undertaking the task. Baseline samples were collected for analysis and analyzed in NEMA accredited laboratories.

1.4.3 Desk Review

A desk top review was done to collect secondary data especially from the Feasibility study for the proposed Soit Sugar Factory conducted by MK Changwony and Associates and reference to other ESIA Study Reports on similar subject submitted to NEMA.

1.4.4 Field Data Collection

The study employed various tools and instruments for data collection. These included pre-determined checklists; camera for taking pictures of the site, questionnaires with both open-ended and closed format used to gather primary data and information from neighbors, notebooks for recording notable observations and site layout which included environmental screening and Physical environment that encompasses flora and fauna, geology and soil types, safety issues as well as noise pollution. Interview guide was used to get information from the Key informants who included the area MCA, area chiefs, village elders and lead sugarcane farmers in the area. Other key stakeholder and departments were engaged among them the County Government of Narok and national governments.

Data from the general public was obtained using a closed and open-ended questionnaire circulated among the sampled respondents in the community.

The data gathered was evaluated, analyzed to determine the required level of environmental performance. Recommendation action plans were made with a view to ensure compliance with the National Environmental Management Authority requirements and/or guidelines relating to issues listed in Environmental Management and Coordination Act. Sampled questionnaires have been attached to the appendices of this report.

1.4.5 Reporting and documentation

The reporting and documentation followed the format provided by NEMA (through both EMCA, 1999 and the Environmental Impact Assessment and Audit Regulations-Legal Notice No.32 of 2019). The proponent was continually informed throughout the period of report preparation to ensure that they were aware of the issues raised and the recommendations that were likely to be made regarding the best practices to mitigate environmental and social impacts.

1.5 Scope and Terms of Reference of the Study

1.5.1 Scope

A project proponent is required to undertake an Environmental Impact Assessment study before undertaking any project highlighted in Schedule 2 of the Environmental Management and Coordination (Amendment) Act, 2015. This study undertakes to fulfill this requirement. This report is necessary at the planning stages of the undertaking to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation, and decommissioning of the facility.

The scope of the ESIA was to undertake the following key tasks:

- **Detailed desk-top review**: This involves review of all existing documentation especially the ESIA Study Report and then providing a concise description of the proposed sugar mill including its geographic, ecological, general layout of facilities including maps at appropriate scale where necessary information on size, capacity, facilities and services should also be provided.
- **Description of the baseline environment:** This involves collecting and documenting the baseline information on the environmental characteristics of the existing situation in the proposed factory site and neighborhood. This description will consider:

- ✓ Physical environment which includes topography, soils, land cover, land use, climate, hydrology and drainage, and sound levels.
- ✓ Biological environment comprising of flora and fauna types and diversity, endangered species, sensitive habitats.
- ✓ Social and cultural environment present and projected population, land use, planned development activities, community social structure, social services, road networks, employment and labour market, sources and distribution of income, cultural/religious sites and properties, vulnerable groups and indigenous populations.

- **Occupational health and safety concerns:** The Consultants analyzed and have described all occupational health and safety concerns brought about by activities during all the phases of the project. The Consultants have also made recommendations on corrective and remedial measures to be implemented under the environmental management plan.
- **Determination of impacts of project facilities and activities:** From the detailed baseline environmental assessment, the Consultants have analyzed and described all significant changes brought about by each project activity. These encompasses 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. The Consultant prioritized the concerns identified and differentiated between short, medium, long-term and cumulative impacts during construction, operation and decommissioning phases of the project. Both temporary and permanent impacts were also identified in this study.
- **Legislative and regulatory framework:** The experts identified and described 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 were also be detailed.
- **Development of management plan to mitigate negative impacts:** The Consultants have developed a comprehensive environmental and social management plan. The plan recommends a set of mitigation, monitoring and institutional measures to eliminate, minimize or reduce to acceptable levels of adverse environmental impacts and/or

maximize socio-economic benefits. The Consultants provided details on the institutional, time frame and responsibility for long term environmental management of the proposed Soit sugar factory.

- **Development of an environmental monitoring plan:** The Consultants have assigned a specific description, and technical details of environmental monitoring measures, including the parameters to be measured, methods to be used, monitoring locations, and frequency of monitoring.
- **Preparation of Environmental and Social Impact Assessment Study Report** which was done in accordance with the regulatory provisions.
- **The Consultant shall submit the Study Report for approval by NEMA.** The Consultant shall be responsible for making any modifications that the authorities may demand before approval of the report and issuance of an EIA License.

1.5.2 Terms of Reference (NEMA/TOR/5/2/546)

The following were the terms of reference:

i) Prepared the TOR for submission to NEMA for consideration and approval. The approved TOR is NEMA Ref No. NEMA/TOR/5/2/546.

ii) Hold meetings with the project proponent, and other stakeholders to establish the procedures, define requirements, responsibilities and a time frame.

iii) Carry out a detailed systematic environmental assessment at the proposed project site and the surrounding area in line with established standards and laws.

iv) Provide a description of the proposed activities throughout the entire implementation process of the project with a special focus on potential impacts to the surrounding environment and facilities.

v)To provide a description of the location of the proposed development project

vi) To provide a concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.

vii) To provide objectives of the proposed project.

viii) To provide a description of the potentially affected environment.

viii)To identify environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.

ix)To recommend a specific environmentally sound and affordable wastewater and solid waste management system.

x)To provide alternative technologies and processes available and reasons for preferring the chosen technology and processes.

xi)To analyze of alternatives including project site, design and technologies.

xii)To prepare an Environmental Management/Monitoring Plan proposing the measures for eliminating, minimizing/mitigating adverse impacts on the environment, including the cost, timeframe and responsibility to implement the measures.

xiii)To provide an action plan for the prevention and management of the foreseeable accidents and hazardous activities in the cause of carrying out development activities.

xv) To propose measures to prevent health hazards and to ensure security in the working environment for the employees, residents and for the management in case of emergencies.

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

xv)Such other matter as NEMA may require.

1.5.3 Details of Project Proponents

The proposed Soit sugar factory is owned by Kenyan investors. The company is owned by the directors of West Valley Sugar Factory and others namely; Mr. Benard K. Soi, Alfred K. Soi, Brenda C. Soi, Brian K Soi, Stanley Kipkirui, Florence Chemutai and Lenah Chesang Kiprop (*CR12 annexed*).

CHAPTER TWO
PROJECT LOCATION AND DESCRIPTION

2.1 Overview

The proposed Soit Sugar Factory project was conceived by the investors in 2020 and Sugar Consultant Agencies tasked to carry out studies, recommend suitable factory outlay and source bidders for the project. The ESIA experts have been brought on board to ensure the project meets the requirements of EMCA 1999 (Revised 2015) and the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019 as stipulated in the Legal Notice No. 31 and 32.

2.1 Project Location

The project is located on Plot No. Trans Mara/Olomismis/1690 measuring 23.640 Ha. It is found in Esaie sublocation, Olomismis location, Kilgoris ward, Transmara West subcounty, Narok county. The GPS Coordinates for the site are Latitude: **1º01'24.4''S,** Longitude**: 34º54'57.4"E.** The site is located 30 Km from another sugar factory-Transmara Sugar Factory.

The proposed Soit Sugar Factory site is about 5 Kilometers from Kilgoris Town. It is within 15 kilometers radius of sugar cane catchment an area measuring 7,000 Ha of suitable land for sugar cane growing. In the light of the prevailing environment and the existence of another factory in the same region, the cane command area of the proposed sugar factory is expected to fall in Olomismis covering a radius of 15 kilometers.

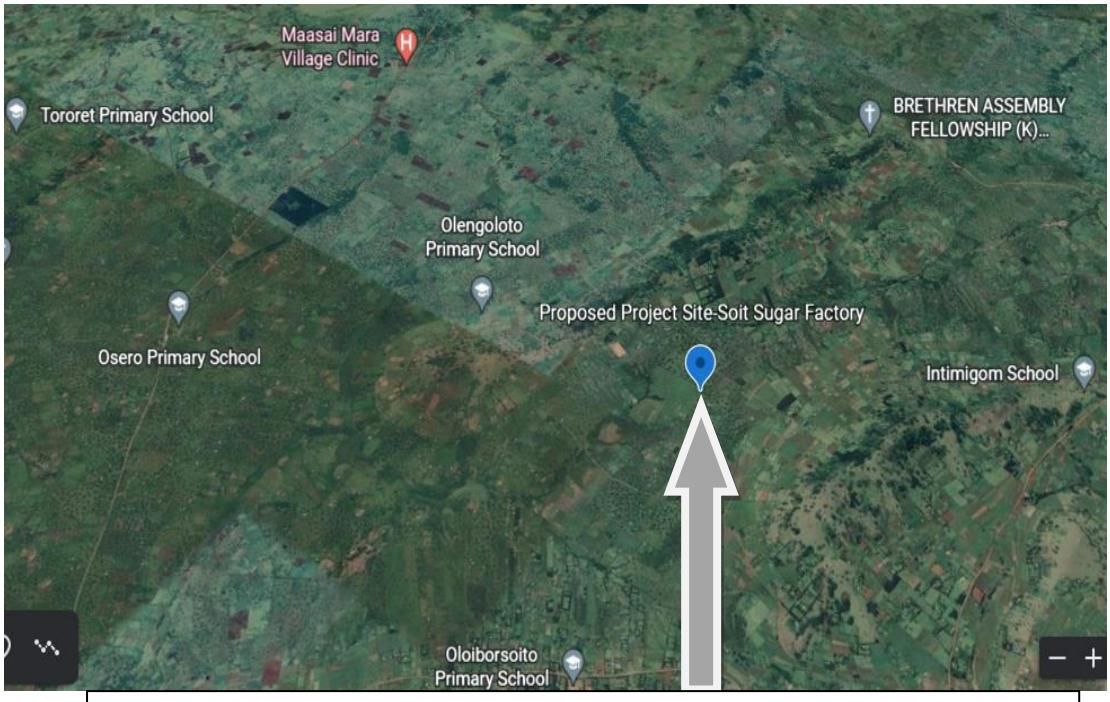

Figure 2: Proposed Project Site on plot L.R No. Trans Mara/Olomismis/1690
Source: Google Earth

2.1 Goals of the Project

The goal of the project is to establish a 1250 TCD sugar factory expandable to 2500TCD. The project is expected to

- Utilize the excess sugar cane in the area and help alleviate the suffering of the sugarcane farmers who have decried sugarcane remaining unharvested for long periods.
- Assist Kenya to meet the existing sugar deficit of 280,000 tonnes per year (Domestic demand for sugar is currently estimated at 780,000 metric tons against an average production of 500,000 metric tons.
- Reverse the current trend of continuous importation of sugar into the country thereby draining the country's foreign exchange and job exportation.

Thus, the main purpose of the project is to increase sugar production in the country in order to meet domestic sugar demand.

2.2 Project Objectives

In order to achieve these goals, the objectives of the project are as follows: -

- Expand production of sugar cane in the nucleus farms and out growers' field
- Construct and establish a 1250 sugar processing factory;
- Create employment to the residents of Olomismis, Kilgoris, Narok County and Kenya at large as well as other staff for operating the sugar processing mill by engaging professionally qualified individuals;

2.3 Justification for the Project

Domestic sugar production in Kenya does not meet consumption demand. Existing consequently, expanded production and creation of more sugar mills within regions of high agricultural potential is necessary for expansion of the industry. Transmara, has suitable Climate and soils for sugar production. TransMara West sub county produces a lot of sugarcane alongside other agricultural activities and livestock keeping. Currently, farmers in Olmismis have suffered big losses due to the distance travelled by the existing sugar milling factories which are located far and situation made worse by poorly maintained roads in the area where they claim their sugarcane stays even upto 4 years unharvested lowering their output.

In case of technical breakdown in the nearest sugar factory, the farmers in the area have been incurring big losses with the sugarcane stranded with nowhere to take them. SSCL has identified this gap and as a remedy, the directors have proposed to build a 1250 TCD Factory

(Expendable to 2500 TCD) in Olmismis. The proponents have extensively and diligently analyzed the present and future scenario of sugar industries. They have carefully reviewed surplus cane availability in the target project area, as well as future potential of additional cane availability.

The current policies in Kenya's Sugar Industry are supportive to such projects. The sugar market in Kenya is growing each year with demand growing faster than production.

The promoters' cognizance of the support it receives from the community in their current businesses makes this project valuable in the sense that it will contribute to socio-economic development of the region. The design of this project responds positively to the aspiration of the sugar sub sector and environmental health. Overall, the entire integrated project is proposed to be set up based on a clear business agenda whose primary interest will be to improve shareholder value. This will be done by ensuring that each component of this project will justify its costs and can stand independently, ensuring that the integration effort or synergy will enhance individual commercial viabilities of these stand-alone projects.

2.4 Project Description

The company's operations will include the following: -

i) Production of sugar cane in its nucleus estate and out-growers' fields;

ii) Processing mill white/mill brown sugar from harvested sugar cane at the proposed Soit Sugar Factory at Olomismis location;

iii) Generating 3 MW captive power for factory use in nucleus estates.

The Out growers targeted by the proposed sugar factory will be expected to fall mainly within 15 km radius of the factory area and will cover mainly Olomismis and Kilgoris areas of Transmara west subcounty. Out of the mapped area, 60% of cane is established and the balance of 40% will be new crop establishment and will be planted in synchrony with factory crushing capacity.

2.4.1 Nature of the Project

The proposed project will involve a new vacuum pan plant consisting of a 1250 TCD (Expendable to 2500 TCD). The project also considers to have a cogeneration power plant of 3 MW. The process involved at the mill will be as illustrated in the diagram below. (Figure 2.4.1).

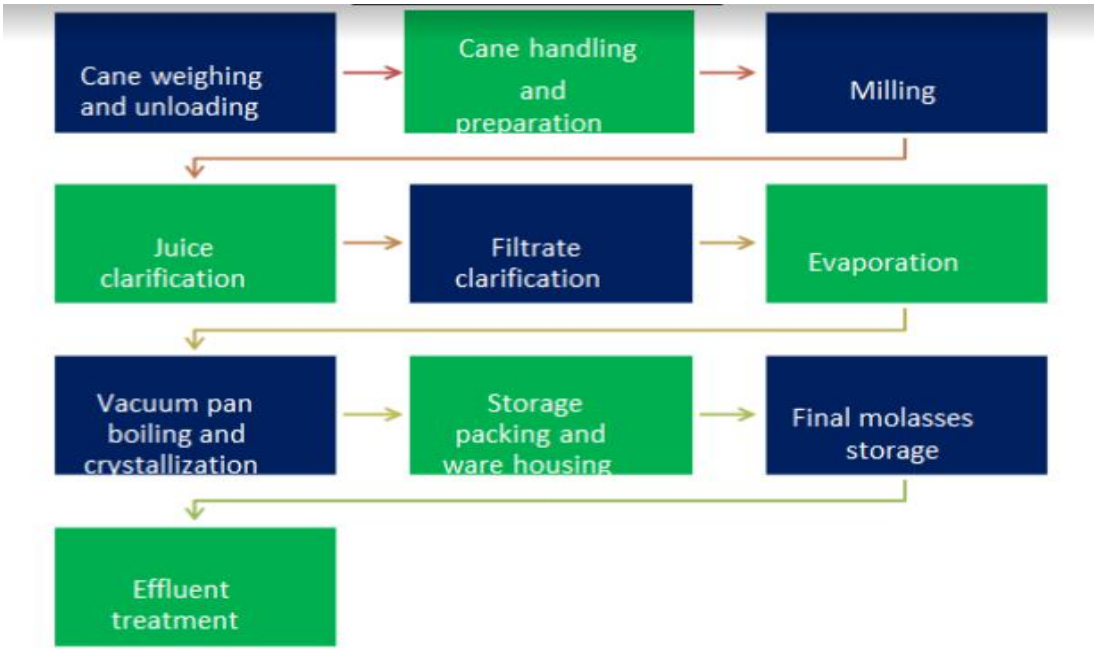

Figure 2.4.1: Simple illustration of the proposed sugar milling process

2.4.2 Project Components, Equipment and Specifications

2.4.2.1 Land Acquisition

The proposed Factory is located inside Land Parcel number Trans Mara/Olomismis/1690 measuring 23.640 Ha on registry map sheet No. 4. The land for the proposed sugar factory development was acquired from the registered owner Mr. Gideon Kiputa (See title deed attached) who has agreed to sale the land to Soit Sugar Company. The proponent has enough land and has in total acquired land area of approximately 60 acres in anticipation of future expansion. Additional land adjacent to the proposed project site will be acquired at appropriate time for further expansion and for nucleus estates. The area lies within an area with good soils, well distributed Rainfall and existing cane plantations. It has a huge potential for the sugarcane growing, with the majority of the farmers being cane growers with surplus cane in their fields.

2.4.2.2 Buildings, Area requirement and Layout

The factory buildings will be constructed in accordance with the machine supplier's specifications and the architectural plans layout will be contracted locally by the proponent. All the constructions will be done under the guidance of the Project Engineer. The proponent has considered a site layout design with an estimated area of 200,000 m^2. This space is distributed as outlined in the table below.

Item	Area Required (m2)
Sugar Plant (including cane yard, sugar silos & go-downs)	70,000
Co-gen power plant (including bagasse / storage)	75,000
Miscellaneous (expansion, staff quarters, admin office, guest house, internal roads, open spaces, rainwater harvesting, gardening, forestry, etc.)	55,000
Total	**200,000**

These considerations are provided for planning purposes, the allocation on the above table will be reviewed during detailed site discussions with selected contractors and design details of the mill.

The factory will be constructed using locally available materials including blocks, cement, ballast and timber, all obtained from nearby suppliers or from Narok Town. According to the preliminary design provided by the supplier in India, the buildings to be constructed will mainly consist of the factory structures and the following: -

a. Workshops,
b. Administrative offices,
c. Weighbridge,
d. Cane yard,
e. Pan and Mill House,
f. Bagasse Handling area for boiler
g. Boiler
h. Power house,
i. Control Panel Room
j. Chemist office and laboratory
k. Sugar house,
l. Effluent Treatment Plant,
m. Molases storage tank
n. Agriculture office
o. Staff houses
p. Warehouse and Go downs

2.4.2.3 Utilities and consumables

Electricity and water are crucial for the operation of this plant. During construction, water will be easily available from the nearby Olchoro lentim water project (Earth dam) bordering the lower area of the land and approximately 300m away from where the factory is to be sited. Being a ground water potential area, the dam was sited strategically where there is good recharge by springs and runoff. Therefore, from the mapping and the community feedback, it has enough water to serve the factory but the proponent has proposed to drill boreholes instead and do a similar dam to supplement the supply for the community and the factory during operational phase of the project upon obtaining abstraction permits and approval for water works.

The factory will be connected to the KPLC National grid to ensure that during construction, power will be available on site. A three-phase power line is connected to the site. During operation, the factory will supplement this by producing 3 MW at the Cogen plant where bagasse will be used to drive boilers and generate steam to run turbines.

2.4.2.4 Sugar Plant

The proposed sugar plant will be of 1250 TCD (Expandable to 2500 TCD). Necessary staging for all the machinery including supporting columns, integral floor structure, staircases, railings etc. shall be provided. Mills, mill drive, turbo generator, clarifier, filter, lime and boiler operating platform shall be on RCC staging. Other machinery except those on floor level shall have its own supporting steel staging. Pipelines, mill and powerhouse cranes, condensers, flash tanks, cyclones, separators can be supported on building columns. No weight of other machinery or platform shall be transmitted to building columns. All gangways, passages, staircases, working platform and railing shall be convenient.

A clear working platform of at least 1.5 m width should be provided in working front of pans and evaporator bodies.

2.4.2.4.1 Projected plant Operations activities

Plant Operations	Unit	Quantity/No or %
Crushing Capacity per day	[Tons per Day]	1,250
Plant Days Annual	[Days]	365
Mill Operating Days	[Days]	250
Working Hours	[Hours]	22
Maintenance Days	[Days]	115

Maintenance Start Month	[Month]	3
Mill Crushing Efficiency	[Percentage]	80%
Incremental Crushing Efficiency	[Percentage]	2%
Cane Required Annually	[Tons]	229,166.67
Cane Required per Month	[Tons]	19,097.22
Sugar Extraction	[Percentage]	10.00%
Molasses Extraction	[Percentage]	4.00%
Bagasse Produced	[Percentage]	30.00%
Filter Mud	[Percentage]	2.00%
Steam Produced from 1kg bagasse	[Kg]	2.10
Steam required to produce 1MW power	[Tons]	6.50

2.4.2.5 Power Generation Plant (Cogen Power Plant)

The plant targets to produce 3 MW as per the proposed design for own factory consumption. The proposed Factory is a 12500 TCD expandable to 2500. The Co-gen power project of 3 MW expandable to 6 MW will mainly operate on mill bagasse during 250 season days the sugar plant will be milling and on saved bagasse for 27 offseason days. At designed levels, it will generate about 4 Megawatts and will utilize the surplus power to run other industries.

The proposed design of Co-Gen plant will initially run efficiently with steam powered turbines which although low in power generation efficiency will be cheaper compared with DC motors or hydraulic drives. The design specification should allow upgrade of the system to hydraulic system at the time of expansion of the plant to 2500 TCD.

The details of this power generation are as provided below:

2.4.2.6 The Boiler (One in Number)

One water tube boiler shall satisfy the following conditions:

1. MCR (Maximum continuous: 40 tons per hour rating) evaporation
2. Pressure at super heater outlet: 45 bar(a)
3. Temp. of super heater outlet: 440C ±50C at 60% to 100% of MCR
4. Feed water temperature at deaerator outlet: 1050C
5. Excess air % theoretical air: Not exceeding 35%
6. Temp. of gases at the outlet: 1700C

7. Efficiency: 70% on GCV (2270 kcal/kg) of bagasse having 50% moisture, ash % less than 1.5% with bagasse as fuel.

2.4.2.7 Steam turbine & its auxiliaries

2.4.2.7.1 Turbo Alternator Set

One Turbo alternator set of 3000 KW capacity. The steam turbine shall be designed for operation of the following ranges of steam parameters:

2.4.2.7.2 Inlet Steam Pressure

Table 2: Inlet steam pressure

Maximum	45 Kg/cm^{2}g
Normal	43 Kg/cm^{2}g
Minimum	38 Kg/cm^{2}g
Inlet Steam Temperature	
Maximum	440 ^{o}C
Normal	430 ^{o}C
Minimum	420 ^{o}C
Exhaust Steam Pressure	
Maximum	1.75 Kg/cm^{2}g
Normal	1.5 Kg/cm^{2}g
Minimum	1.0 Kg/cm^{2}g

The turbine should be so designed that it suffers no damage if exhaust pressure occasionally goes down to atmospheric pressure and/or live steam temperature goes up to 440 ^{o}C

The specific steam consumption at its rated speed and on normal steam operating parameters should not exceed 12 kg/KW/hour while delivering 3000 KW.

2.4.2.7.2 Safety Devices

The turbine shall be provided with following safety devices:

i. Over speed trip with audio visual alarm
ii. Low oil pressure trip with audio visual alarm
iii. The turbine should trip when the alternator ACB trips due to differential protection
iv. Manual Trip Nob/Handle
v. High Back Pressure Trip
vi. Axial movement trip

vii. Remote operated manual trip with audio visual alarm

Special maintenance tool for turbine shall be supplied along with turbine.

The alternator shall be suitable for developing continuously 3750 KVA (3000 KW at 0.8 power factor) 3-phase, 50 cycles/sec at a normal voltage range of 415 V, and shall conform to IS – 4722 – 1968 specifications

2.4.2.6 Effluent Treatment Plant

During processing, the water effluent from the plant, mainly consisting of bagacillo and floor washings, which are rich in BOD, will be taken to modern effluent treatment plant to reduce level of biological oxygen demand (B.O.D) to less than 30ppm and remove suspended matter. The ETP plant shall be designed for following parameters. It shall perform as shown upon reaching steady state of its operation.

Table 3: ETP Design Parameters showing assumed and treated levels

Sr. No.	Parameter	Effluent (Assumed)	Treated Affluent
1	Flow (m^3/Day)	250	250
2	pH	04-Jul	6.5-8.5
3	Oil/Grease (mg/l)	30	<10
4	BOD (mg/l)	1200	<30
5	COD (mg/l)	2500	<200
6	TSS (mg/l)	300	<100

- ***Effluents from the Sugar Plant***

The sugar plant effluents will be treated in a separate Effluent Treatment Plant with final Reverse Osmosis. The discharges will be maintained as per the latest norms of NEMA as spelt out in Water Quality Regulations 2006 (Legal Notice No. 121). The liquid effluents from the sugar process will be mainly waste water from various process equipment in the milling and boiling house sections and the treated water will be used for gardening purposes.

- ***Effluents from the Cogen Power Plant***

The Cogen power plant effluents will also be treated in a separate effluent treatment plant and the discharges will be maintained as per the latest norms of NEMA. The liquid effluents

generated from the Cogen power plant will be mainly from boiler blow down, cooling tower and water treatment plant blow downs, wash water and other sewage effluents.

2.4.2.7 Weighbridge

The installed weighbridge will be automatic with computerized weight recording, printing facility and capable of accounting and generating up to date crushing status report, analysis using relevant software for report generation, including identification of farmer, tractor number, cane variety among others.

2.4.2.8 Cane Handling and Feeding

The yard will consist of a weighbridge and overhead gantry. The cane preparation equipment will consist of a cane carrier, a cane kicker to regulate feed cane knives and a fibrizer. All operations will be electrically controlled from the operator's cabin. The overhead unloading crane will be capable of undertaking 20 lifts per hour while grabbing and lifting approximately 2-3 tonnes of cane per lift. The crane will be complete with its accessories, gantry columns, attendant platform along the length of the gantry on sides.

2.4.3 Sugar Milling Process

The sugar processing plant will be based on a milling capacity of 1250 TCD (Expandable to 2500 TCD). This is a simple three step process which will include Cane milling, Evaporation and Crystallization. The standard flow sheet as will be adopted can be given as;

2.4.3.1 Juice Extraction

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. Modern design mill will be installed which will be fully equipped with turbine drive, special feeding devices, efficient compound imbibition system etc.

Bagasse will be the byproduct of this process as a residue. The bagasse generated will be approximately 30% of the total cane processed.

2.4.3.2 Clarification

Extracted juice is taken through a heating with temperatures between 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

2.4.3.3 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.

2.4.3.4 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.

2.4.3.5 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 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. molasses 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 final molasses is sent out of the factory as a by-product used for animal feed etc.

2.5 Project Cost

Factory design is as provided by Saisidha Sugar Equipments & Engineering Company the selected EPC contractor and the cost estimate will be as specified below.

From the Bills of quantities, the estimated total cost of setting up the factory is **1.508 billion Kenyan shillings** (**Ksh. 1,508,365,987)**. The statutory charge of 0.1% processing fee payable to NEMA is therefore **Ksh. 1,508,365 (One million, five hundred and eight thousand, three hundred and sixty five shillings.** The payment is done on the e-citizen platform after receipt of an invoice from NEMA.

CHAPTER 3
BASELINE ENVIRONMENTAL CONDITIONS

3.1 Background Information

This Chapter introduces the project site, its location in the County, its total area, the main physical features and its administrative units. The chapter also highlights the county's socio-economic characteristics in addition to its profile. The information here provides a general overview of Transmara West Sub- County.

The proposed Factory is located inside Land Parcel number Trans Mara/Olomismis/1690 measuring 23.640 Ha. This location boasts of the best location for production of Sugar Cane as demonstrated by the sugar suitability map below. The factory will be cited at the Centre of the circle. The circle covers a radius of 15 kilometers of an area mapped out as S1 and S2, representing the most potential area for sugar cane growing in the subcounty. Soit Sugar Factory is located in Olomismis in Transmara west subcounty, about 5 Kilometers from Kilgoris Town. It is within 15 kilometers radius of sugar cane catchment an area measuring 7,000 Ha. The GPS Coordinates for the site are **Latitude: 0º 19'17.22''S, Longitude: 35º03'18.17" E.**

The environmental resources examined in baseline analysis include:

(a) Physical resources (climate, soils geology, ground water and surface water)

(b) Ecological resources (aquatic biology e.g. fisheries, wildlife, forests and endangered vegetation species, protected coastal resources.

(c) Economic development (infrastructural facilities such as water supply, sewerage, flood control, roads, land use, power sources, agricultural development, mining and tourism).

(d) Social and cultural resources (e.g. population numbers, locations, composition, employment, health facilities, socio-economic conditions e.g. social well-being, physical or cultural heritage, current use of lands and resources for traditional purposes by indigenous people, sites that are for historical, archaeological, paleontological of architectural significance**.**

3.2 Physical Resources

3.2.1Topography and Soils

The study area is composed of three soil types (Figure 3.2.1.2): clayey, loamy, and sandy soil. Most parts have clay soils rich in fertility and water retention while some parts have large pockets of loamy soils suitable for agriculture. Despite the varied characteristics of the soils the subcounty is classified as arable.

Figure 3.2.1.1: View of the soils near the proposed project site.

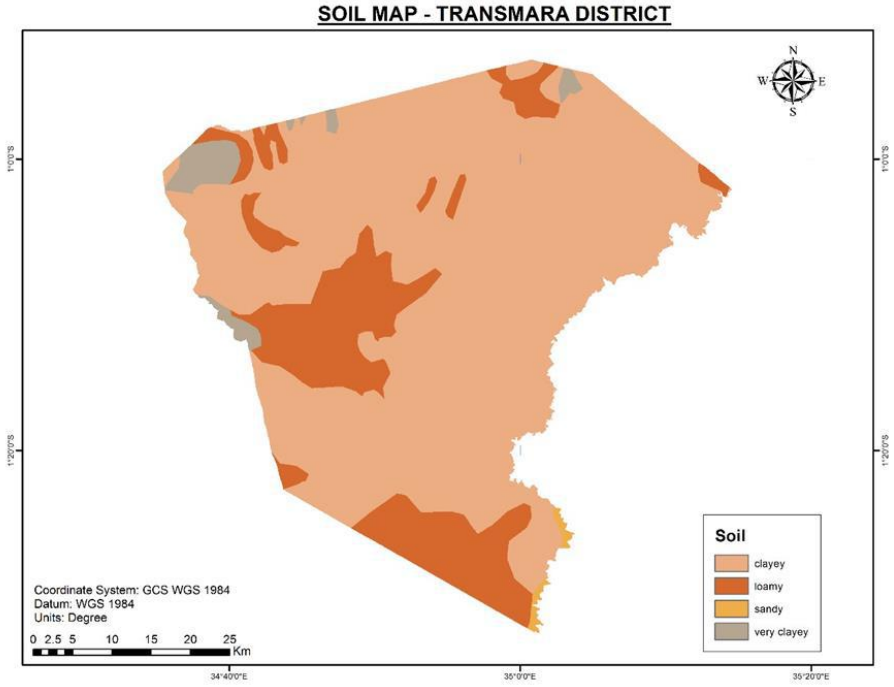

Figure 3.2.1.2: Soil map showing soil distribution in the subcounty

3.2.2 Geology

Geology depicts the litho-units and formations that are present in an area. It provides an insight into the sequential arrangement of rock formations below the earth surface. Identification of the litho-units helps to determine the infiltration capacity, permeability and its ability to discharge and store water (Figure 3.2.2). Transmara is covered with Igneous, Precambrian and sedimentary rocks. They are wind deposited materials that consist primarily of sand or silt-sized particles. These materials tend to be extremely well sorted and free of coarse fragments promoting infiltration.

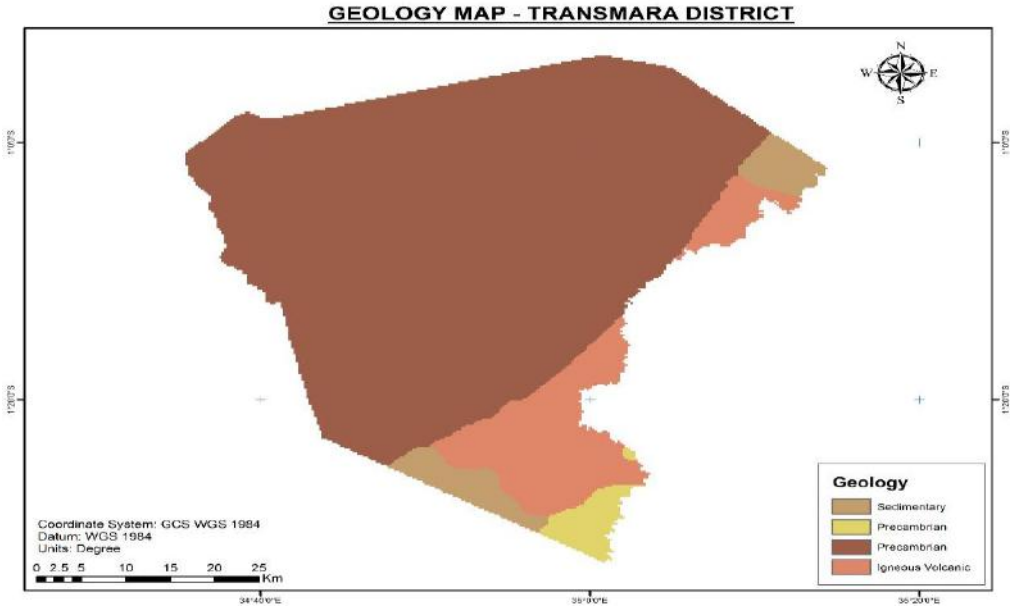

Figure 3.2.2: Geology of the project area

3.2.3 Agro-ecological zones

Soit sugar company catchment, to the extent of up to 15 km radius from the site of the factory, is a major source of cane in the area. Since the establishment of Mara Sugar Factory, this region embraced and continues to be a cane growing area with maize being the other common crop. The climatic conditions and rainfall in this area are ideally for growth or sugar cane. From climatic data of the region, it is observed that the maximum and minimum temperatures and relative humidity are quite favorable for growing of sugarcane for higher recovery. The yields of the different varieties of the cane vary depending on agro-climatic conditions and water availability, from year to year. The area designated to be the catchment of this factory is estimated to achieve cane yields of around 70 to 100 MT/Ha. The catchment area of the factory

comprises of members of a group ranch measuring 16,000 ha which has since been sub divided into individual titles and issued to the members. The factory will be cited at the Centre of the circle as shown below.

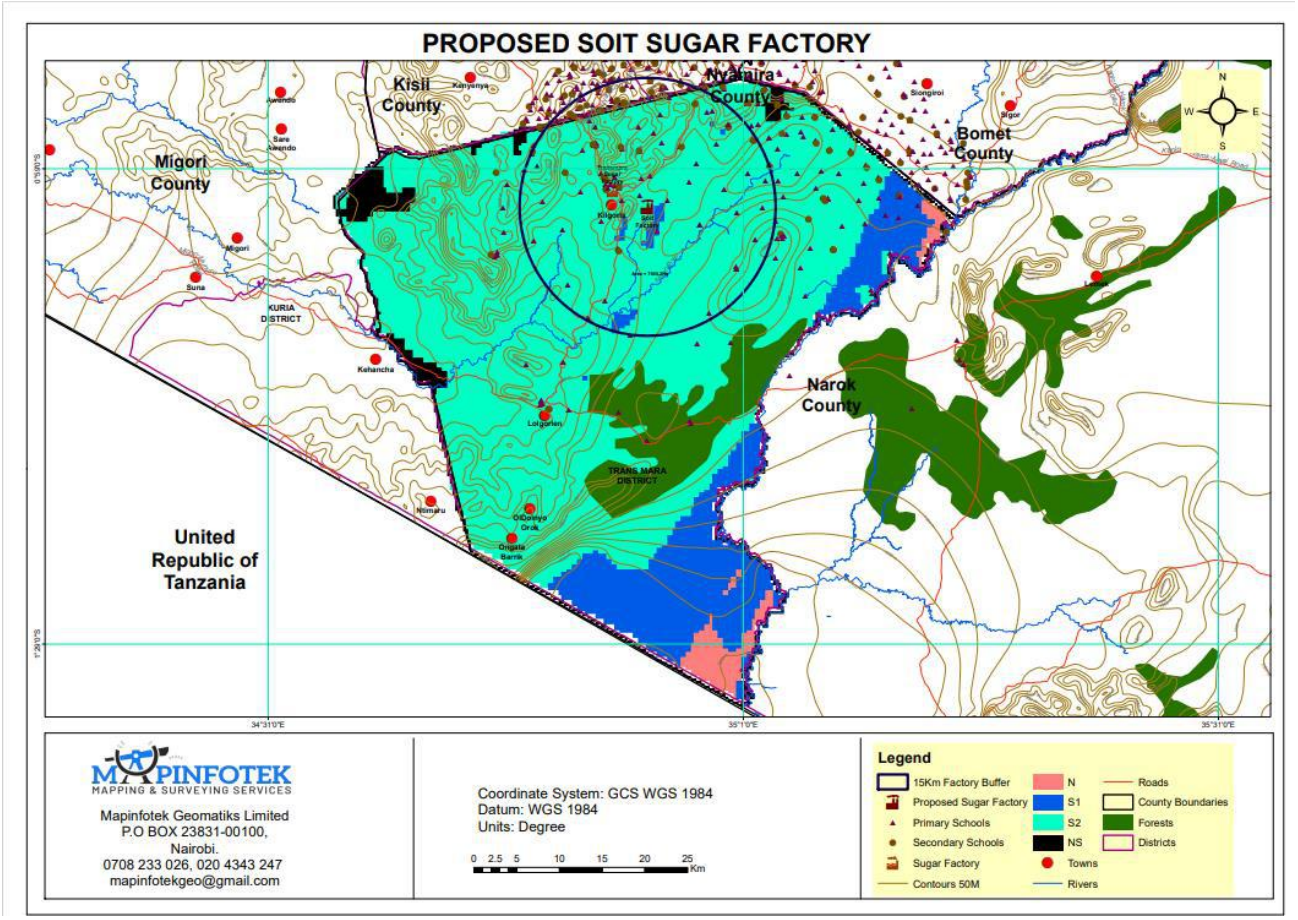

Figure 3.2.3: Map sugarcane growing zone within the proposed project area and the target catchment area (inside the circle)

The circle covers a radius of 15 kilometers of an area mapped out as S1 and S2, representing the most potential area for sugar cane growing in the sub county.

3.2.4 Climate

The county experiences highland sub-tropical climate with moderate temperatures, low evaporation rates and high rainfall in lower areas, and high temperatures, high evaporation and low rainfall in the upper highland areas. The county further receives conventional type of rainfall influenced by altitude and by the movement of the inter-tropical convergence zone (ITCZ). Due to the convectional origins of rainfall, there is high seasonal variability exhibiting high intra and inter-seasonal variation. Rainfall is well distributed except during the short dry season in January and February. The wettest months are April and June, though there is no real break between the short and long rains in the whole county. The total annual rainfall ranges from 1,700mm to 2020mm per annum.

3.2.4.1 Rainfall

The area lies within an area with good soils, well distributed Rainfall and existing cane plantations. Rainfall pattern is bi-modal with annual mean rainfall of 1600 mm. Principal wet season occurs between February and June while short rains are experienced between August and November. It has a huge potential for the sugarcane growing, with the majority of the farmers being cane growers with surplus cane in their fields.

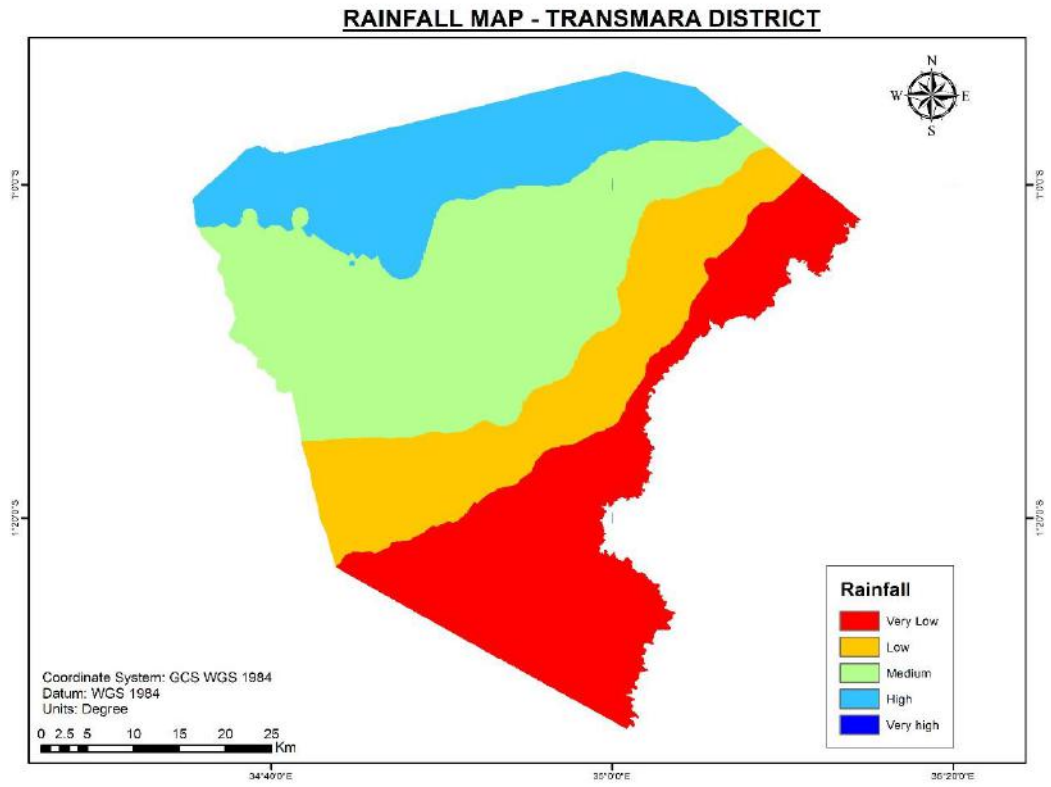

Figure 3.2.4.1: Rainfall pattern in Transmara West subcounty

3.2.4.2 Temperature:

The average maximum temperature recorded at proposed site is 30 ^{0}C, while the minimum temperature recorded is 9 ^{0}C. An analysis of the mean temperatures is presented in Figure 7 below. The hottest month was February with a mean temperature of 24.6^{o}C. An analysis of the mean temperatures is presented in Figure 3.2.4.2 below

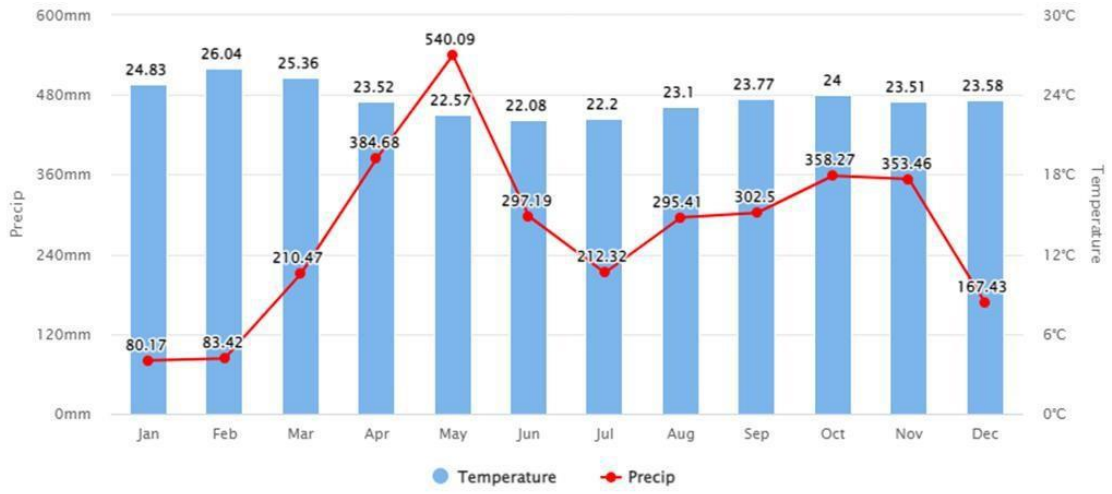

Figure 3.2.4.2: Rainfall pattern in Transmara subcounty

3.2.5 Hydrology and Ground water Potential

The Proposed site is located approximately 300m from Olchoro lentim dam. The water project is for the community and mainly for livestock. The dam is recharged by springs which also form part of the community drinking water project.

The ground water potential zones were demarcated with the help of GIS through the influence the various features

Figure 3.2.5.1: View of Olchoro lentim dam

Figure 3.2.5.2: Experts sampling spring water for analysis

The *Figure 3.2.6* below illustrates the various classes of ground water zones mapped in this study. The classes were: **low potential areas, medium potential areas** and **very high potential areas**. Very high ground water potential areas are characterized by high presence of lineaments, low drainage density, very low to non slopy areas, high rainfall and forest, vegetation and cropland land covers. The low potential areas were characterized by clay soil, low to no lineaments, high drainage capacity, slopy areas, areas receiving very low rainfall and built-up areas. The proposed Soit Factory in Figure below indicated that the area has a **very high potential** for ground water harvesting.

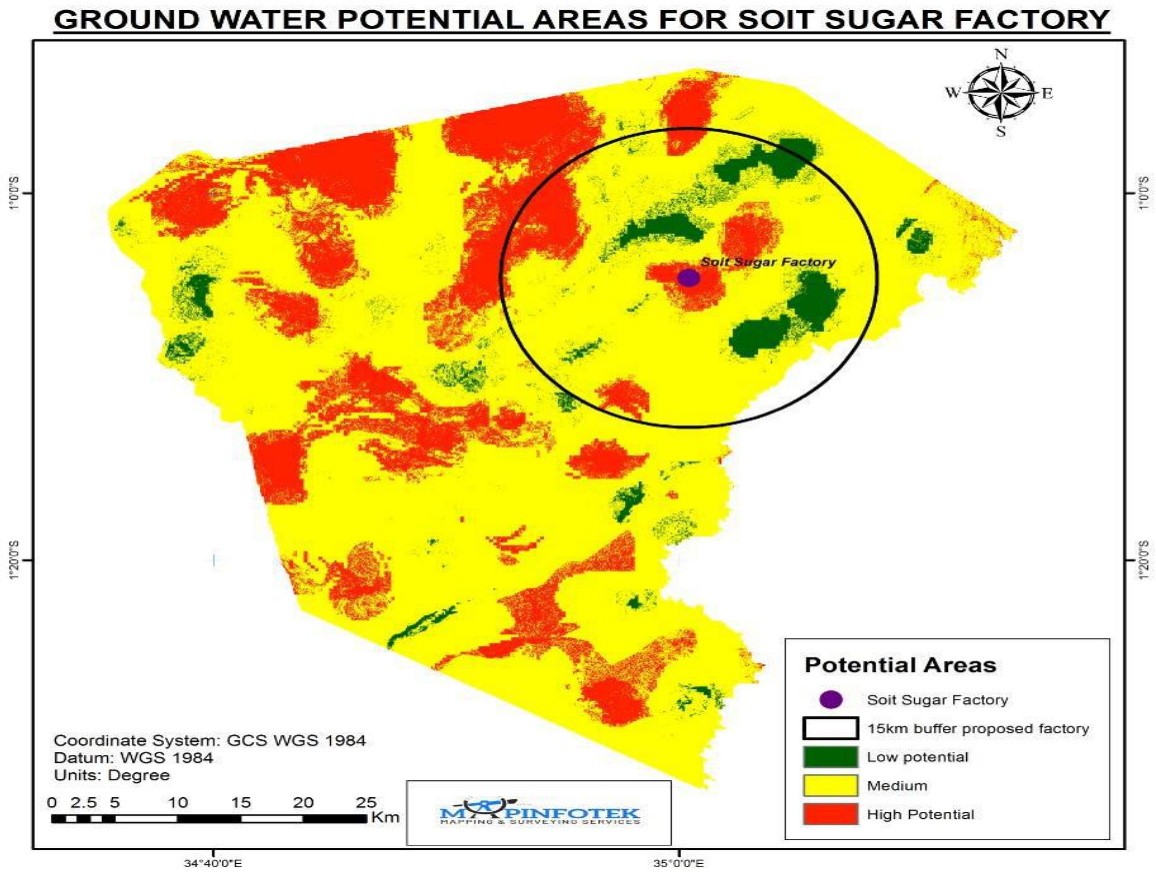

Figure 3.2.6: Groundwater potential zones in the project area

3.3. Ecological resources

3.3.1 Flora and Fauna

The natural vegetation in the project area have substantially been disturbed by human activity. Natural vegetation is only found in the protected areas in the Mau complex to the east. Most of the land in the project area is used for human habitation, farming especially sugar cane, tea cultivation, dairy farming, urban development, floriculture and other land uses. The project site is currently under the protection of the proponent and used as a grazing field for goats. The proponent has ensured to conserve the environment by planting indigenous trees, fencing and protecting them from destruction. The area here does not have protected wildlife. Animal likely to be found includes hares, snakes, mice, birds among other small animals.

The predominant tree and plant species found within the project site are: The major grasses are common thatching grass (*Hyparrhenia hirta)* and *Cynodon dactylon* (Star grass). The proposed project site is currently under sugar cane crop.

Most of these tree species grow naturally within the project site while few were planted. Some of these will be impacted during site clearance for construction purposes. The project shall however as much as possible avoid unnecessary clearance of vegetation. Revegetation program shall be done to compensate for any lost vegetation after the project.

Figure 3.3.1: Common vegetation currently dominating the proposed project site

3.4 Social and cultural resources

3.4.1 Population characteristics

The proposed Soit sugar factory falls within Kilgoris in Narok County, Kenya. The town has a population of 70,475 according to 2019 census.

3.4.2 Average Farm Size

The average farm size under small scale is 6.1 Hectares and that of large scale is 26.3 Hectares with barley, tea, sugarcane and wheat being grown as the major cash crops. There has been sub-division of land into uneconomic units in some parts of the county while some large-scale farms remain unutilized. The proposed project site is approximately 23.65 Ha

3.4.3 Mean Land Holding Size

In Narok county, the average land holding size in the county is approximately 16 acres. This is not uniform throughout the county. There are individuals who own thousands of acres, especially in the wheat producing areas. Land within the conservancies which is owned by members of the conservancies has bigger acreages. This is basically because these areas are conservation zones.

3.4.4 Economic profile

Poverty in Kenya remains a challenge requiring urgent attention. The bigger challenge is unemployment for the youth who some have graduated from universities but have no meaningful engagement. This has resulted in inadequacy of income and deprivation of basic needs and rights, and access to productive assets as well as to social infrastructure and markets.

Narok county has a low economic base despite the presence of tea industry. The local populace depends on subsistence farming. Unemployment rate is high, many youth are therefore involved in petty trade, other do causal work plucking tea, while a few who can afford do transport business otherwise commonly known as '*boda boda'.* A bigger group will be found idle around the market centres.

The economic, social and political status of women in the entire Project affected area is relatively weak. Apart from land ownership, most women are vulnerable in many ways. Many get into early marriages after which their roles are largely confined to household management and agricultural production especially tea plucking. They are generally economically dependent upon men who tend to make the decision at the family level.

The quality of housing in the project affected area consists of a mix of permanent, semi-permanent houses and grass thatched houses.

3.4.3 Physical infrastructure

Roads

Narok County has a road network of 4,602 Km. From the network, approximately 185 Km is tarmacked, 1,510 Km is graveled and 2, 907 Km is earth road. The factory will be sited in a country side setting within a rural population. Apart from the main tarmac road connecting Kilgoris and Narok, the area is accessed through a murram roads. Most of the roads are good while some of the feeder roads are only accessible tractors and other large vehicles only. The main challenge in Narok 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. It would therefore make the movement of sugarcane from the farms to the factory quite easy. It is anticipated that these feeder roads will be well maintained especially after the wet seasons to make them motorable.

Figure 3.4.3: Condition of the road network serving the proposed site

Sewer line

In view of the rural setting, the area has no sewer lines. Most homes in the area use pit-latrines. We do not anticipate the development of a sewer system to cover the area in the near future. Other homes use septic tanks which are often exhausted. For now, it is sufficient. However, for the factory development, we shall recommend the use of bio-digester to treat human waste. Other factory effluent will utilize efficient ETPs with final Reverse Osmosis to be constructed. The proponent has set aside adequate land for this purpose.

Communication

Over 88,000 households in the county which is approximately 52 per cent own mobile telephone. Narok town itself is connected with fibre optic cables to enhance access to internet services but only less than three per cent of the population use internet services which implies low level technology penetration.

Water supply and Access to water supply

There is an estimated 1,684 water sources in the county among them dams, rivers, water pans, springs and boreholes which are community and private owned. In the whole county only an estimated 8.6 % of households were benefitting from piped water (Source CIDP-Narok). In 2017, about 1,600 households were estimated to have roof catchments systems for harvesting rain water. The average distance people travel in search of water is approximately 2Km in wet seasons. The distance increases to 10 Km during the dry seasons.

About 7,760 households accessed tap water mainly from protected springs and boreholes. Low flows in rivers and springs have continued to be recorded in the county mainly due to water sources and catchments degradation. Water used in the project area is mainly drawn from the nearby protected spring and Olchoro lentim dam.

The analysis results from water sampled from the community spring and dam indicated that the water will need to be treated in order to meet recommended standards. Summary of analysis results are presented in table 4:

3.5 Baseline Water Quality Sampling and Ambient Air quality Measurements from the site

3.5.1 Baseline Water Quality Sampling and Analysis

The sampling of the water was done according to the following procedures based on methods defined in the ISO 5667: Water sampling and analysis was done between 7th –15th March 2023; water sample was collected from a community water draw off point for spring water and another sample from the nearby dam. The samples were collected by use of a sampling bottles, preserved in cool boxes, and transported to the laboratory for analysis using standard approved methodologies. Sample analysis was done by Imara Analytical Laboratories and NEMA accredited laboratory. The results is as presented in Table 4 & 5 below.

Table 4: Baseline Water Quality Sampling and Analysis Results from the nearby spring

RESULTS:					
PARAMETER	UNIT	RESULT	TEST METHOD	STANDARD LIMITS	INTERPRETATION
PH	pH Values	5.96	Potentiometric	6.5 - 8.5	<6.5
Conductivity	s/cm	88	Potentiometric	800 Max	Normal
Total Dissolve Solids	Mg/L	44	Potentiometric	2000 Max	Normal
Manganese (as Mn)	Mg/L	ND	ICP -AES	1.5 Max	Normal
Chlorides (as Cl)	Mg/L	9.6	Titration	250 Max	Normal
Iron (as Fe)	Mg/L	2.31	ICP-AES	0.3 Max	>0.3
Sulphates (as SÖ4)	Mg/L	4.49	ICP-AES	400 Max	Normal
Nitrates (as N03)	Mg/L	19.8	Titrimetric	10 Max	>10
Sodium (as Na)	Mg/L	ND	ICP-AES	50 Max	Normal
Zinc (as Zn)	Mg/L	ND	ICP-AES	5 Max	Normal
Calcium (as Ca)	Mg/L	6.31	ICP-AES	100 Max	Normal
Copper (as Cu)	Mg/L	0.024	ICP-AES	2 Max	Normal
Lead (as b)	Mg/L	0.041	ICP-AES	0.3 Max	Normal
Molbdenum	Mg/L	ND	ICP-AES	0.04 Max	Normal
Bicarbonates (CaC03)	Mg/L	ND	Potentiometric	150 Max	Normal
Turbidity	NTU	18.0	Nephelometric	5 Max	>5
Total Coliform	Count	1	Total plate Count Per I00 Mls	<1	Present
E. Coli	Count	0	Total plate Count Per I00 Mls	<1	Absent

Source: EIA study for Soit Sugar Factory (Baseline Water Sampling and analysis Report)

Table 5: Baseline Water Quality Sampling and Analysis Results from the nearby Olchoro lentim Dam

RESULTS:					
PARAMETER	UNIT	RESULT	TEST METHOD	STANDARD LIMITS	INTERPRETATION
PH	pH Values	7.15	Potentiometric	6.5 - 8.5	Normal
Conductivity	µs/cm	80	Potentiometric	800 Max	Normal
Total Dissolve Solids	Mg/L	41	Potentiometric	2000 Max	Normal
Manganese (as Mn)	Mg/L	6.24	ICP -AES	1.5 Max	>1.5
Chlorides (as Cl)	Mg/L	9.9	Titration	250 Max	Normal
Iron (as Fe)	Mg/L	13.12	ICP-AES	0.3 Max	>0.3
Sulphates (as SÖ4)	Mg/L	4.13	ICP-AES	400 Max	Normal
Nitrates (as N03)	Mg/L	19.8	Titrimetric	10 Max	Normal
Sodium (as Na)	Mg/L	1.03	ICP-AES	50 Max	Normal
Zinc (as Zn)	Mg/L	0.13	ICP-AES	5 Max	Normal
Calcium (as Ca)	Mg/L	7.95	ICP-AES	100 Max	Normal
Copper (as Cu)	Mg/L	0.02	ICP-AES	2 Max	Normal
Lead (as b)	Mg/L	0.027	ICP-AES	0.3 Max	Normal
Molbdenum	Mg/L	ND	ICP-AES	0.04 Max	Normal
Bicarbonates (CaC03)	Mg/L	ND	Potentiometric	150 Max	Normal
Turbidity	NTU	85	Nephelometric	5 Max	>5
Total Coliform	Count	10	Total plate Count Per I00 Mls	<1	Present
E. Coli	Count	5	Total plate Count Per I00 Mls	<1	Present

Source: EIA study for Soit Sugar Factory (Baseline Water Sampling and analysis Report)

Discussion and conclusions

The results of analysis for spring water indicated that parameters for iron, Nitrates, PH, Turbidity and Total coliform were higher beyond the recommended standards indicating that the water was polluted and needs treatment. Similarly, Manganese, iron, Turbidity, Total coliform and E coli were higher in dam water. All other parameters tested were within the acceptable limits as stipulated in the EMCA (Water Quality Regulation), 2006 Legal Notice 120 of for Quality Standards for Sources of Domestic Water (First schedule).

3.5.2 Ambient Air quality Measurements

The measurements for ambient air quality were done on 22nd March 2023. The standards used to evaluate the measured values are derived from EMC (Air Quality) Regulations, 2014 for ambient air quality standards and The World Health Organization (WHO) Air Quality Guidelines (AQG) and Environmental, Health and Safety General Guidelines (IFC, 2007).

The specific parameters monitored included the baseline concentration of Particulate dust PM2.5, Particulate dust PM10, Sulphur dioxide (SO2), Carbon monoxide (CO), Ozone (O3), Hydrocarbons (CxHy), Nitrogen monoxide (NO), Nitrogen dioxide (NO2) and Nitrogen Oxides (NOx) was undertaken to establish ambient air gases at the proposed project boundaries adjacent to key receptors. Measurements was done using HAZ-SCANNER instrument. The HAZ-SCANNER instrument provides direct readings in real-time with data logging capabilities. Incorporating a dashboard, control panel, the instrument was powered on 20 minutes before collecting data.

Figure 3.5.2: Ongoing determination of the ambient air quality levels at the proposed Soit sugar factory site using HAZ-SCANNER instrument

Discussion of Measurements and conclusions

The table below present the results from the air quality undertaken at the proposed site.

Table 6: **Findings of the Ambient Air Quality Parameters at the proposed project site**

Soit Sugar Company Limited							
Parameter	**Units**	**Maximum**	**Minimum**	**Average**	**Average in standard units**	**Standard limit**	**Remarks**
Carbon Monoxide (CO)	ppm	0.000	0.000	0.000	<0.01 mg/m³	**10 mg/m³**	**Within Limit**
Carbon Dioxide (CO_2)	ppm	299.750	213.720	259.418	479.665 mg/m³	**10 mg/m³**	**Out of Limit**
Hydrocarbons (C_xH_y)	ppm	0.000	0.000	0.000	<0.01 ppm	**np**	**Within Limit**
Nitrogen Monoxide (NO)	ppb	0.971	0.001	0.362	0.457 ug/m³	**np**	**Within Limit**
Nitrogen Oxides (NO_2)	ppb	0.103	0.002	0.025	0.048 ug/m³	**100 µg/m³**	**Within Limit**
Nitrogen Oxides (NO_x)	ppb	1.074	0.003	0.387	0.504 ug/m³	**150 µg/m³**	**Within Limit**
Oxygen (O_2)	%	20.910	20.710	20.844	20.844 %	**np**	**Within Limit**
Ozone (O_3)	ppb	0.000	0.000	0.000	<0.01 ug/m³	**120 µg/m³**	**Within Limit**
Particulate Matter (PM_{10})	ug/m³	5.319	1.036	2.440	2.440 ug/m³	**150 µg/m³**	**Within Limit**
Particulate Matter ($PM_{2.5}$)	ug/m³	1.316	0.981	1.054	1.054 ug/m³	**75 µg/m³**	**Within Limit**
Relative humidity (RH)	%	67.590	60.320	63.046	63.046 %	**np**	**Within Limit**
Sulphur Dioxide (SO_2)	ppb	15.130	3.912	10.904	10.904 ppb	**np**	**Within Limit**
Temperature,	°C	17.990	16.250	17.021			
Wind direction,	Deg.	247.400	40.810	132.200			
Wind speed	kph	0.819	0.000	0.167			
Power	kw	11.480	10.750	11.058			

Source: EIA study for Soit Sugar Factory (Baseline air quality sampling and analysis Report)

Discussion of Findings

All the gaseous pollutants measured were below the permissible limits except for Carbon Dioxide (CO_2). However, Carbon Dioxide (CO_2) accounts for 0.03 % (approximately 540.003 mg/m_3) by volume of the normal dry air, hence the levels were within the expected levels. The area is level terrain with surrounding plantations and trees. There is no major activity in the area likely to cause an adverse increase in the level of air pollutants at the time of measurement. It should be noted that these results represent the findings as at that particular time of assessment, hence, the values are likely to deviate based on prevailing environmental conditions and activities.

CHAPTER FOUR

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

4.1 Overview

Kenya has a policy, legal and administrative framework for environmental management. Under the framework, the National Environment Management Authority (NEMA) is responsible for ensuring that environmental impact assessments (EIAs) are carried out for new projects and environmental audits on existing facilities as per the Environmental Management and Co-ordination (Amendment) Act, 2015.

EIAs are carried out in order to identify potential positive and negative impacts associated with the proposed project with a view to taking advantage of the positive impacts and developing mitigation measures for the negative ones. The guidelines on EIAs are contained in Sections 58 to 67 of the Act. According to Section 68 of the Environmental Management and Coordination (Amendment) Act (EMCA) 2015, The Authority will be responsible for carrying out environmental assessments and audits on all activities that are likely to have a significant effect on the environment.

The government has established regulations to facilitate the process on EIAs and environmental audits. The regulations are contained in the Kenya Gazette Supplement No. 56, Legislative Supplement No. 31, and Legal Notice No. 101 of 13th June 2003.

In the past, the government has established a number of National policies and legal statutes to enhance environmental conservation and sustainable development.

*The proponent will need to observe the provisions of the various statutes that are aimed at maintaining a clean, healthy and sustainable environment***.** Some of the policy and legal provisions are briefly presented in the following sub-Sections

4.1.1 The Constitution of Kenya

Promulgated on the 27th of "August 2010, the constitution of Kenya in its preamble declares that the people of Kenya are respectful to the environment, which is their heritage and they are determined to sustain it for the benefit of future generations. The constitution which is based on the bill of rights as its backbone, states in article 42 that every person has a right to a clean and healthy environment and subsection 1 adds that this includes the right to protect environment for the benefit of present and future generations through legislative and other measures. Article 43 follows declaring economic and social rights of every Kenyan and they include in subsections: (a) the right to the highest attainable standard of health, which includes the right to health care services, including reproductive health care and (d) the right to clean and safe water in adequate quantities. Section 2 of article 43 adds that no one shall be denied emergency medical care.

The constitution also endorses the national land policy and chapter 5 which deals with land and environment states principally in article 60 that land in Kenya will be held, used and managed in a manner that is equitable, efficient, productive and sustainable. The principles are outlined

in subsections of article 60 and article 61 declares that all land in Kenya belongs to the people of Kenya collectively and subsection 2 classifies land to be as either public, community or private and thus it's important to establish in which of these the project lies. The national land commission is established in article 67 and its main function is to manage land on behalf of national and county governments.

Part 2 of chapter 5 deals with the environment and natural resources and article 69 section

(1) subsection (a) states that the state will ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits. The following subsections give regulations in terms of forest cover, biodiversity, cultural resources, indigenous knowledge, systems for environmental impact assessment and prevention of activities that may harm the environment. Section 2 states that 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. Article 70 deals with enforcement of environmental rights and everyone who feels their right to a clean and healthy environment has been denied has the obligation to go to court to seek redress. Article 71 and 72 deal with agreements relating to natural resources and legislation relating to the environment respectively, where parliament is given this authority.

Relevance

The proponent involved members of the public in the proposed development during public participation and shall involve during operation in ensuring the factory operates and at the same time safeguarding the environment.

4.1.2 The Environmental Management and Co-ordination (Amendment) Act, 2015

Environmental Management and Co-ordination Act No. 8 of 1999 has hither to been providing a legal and institutional framework for the management of the environmental

related matters. It is the framework law on environment, which was enacted on the 14th of January 1999 and commenced in January 2002. The Act has since been amended and replaced by Environmental Management and Co-ordination (Amendment) Act, 2015 which was enacted into a law on 3rd January, 2015.

Section 58 of the Second schedule of the Act require proponent of project to submit project reports to NEMA before financing, commencing, proceeding with, carrying out, executing or conducting projects. The Second Schedule to the Act specifies the projects for which an EIA and EA must be carried out. According to Section 68 of the Act, all projects listed in the Second Schedule of the Act must undertake an environmental audit, keep accurate records and make annual reports to NEMA or as NEMA may, in writing, require.

The main objectives of the Act are to:

- Provide guidelines for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya;

- Provide a framework legislation for over 70 statutes in Kenya that contain environmental provisions; and
- Provide guidelines for environmental impact assessment, environmental audit and monitoring, environmental quality standards and environmental protection orders.

In addition, the following regulations to the Act are also relevant to the proposed development.

Under EMCA Amendment, 2015, there are a number of regulations geared towards sustainable development.

Relevance

The proponent shall construct and operate the proposed Soit Sugar Company in compliance with the provisions of this act.

The applicable regulations to the proposed Sugar Factory project are discussed below:

4.1.2.1 Environmental Management and Coordination (Environmental Impact Assessment and Audit) Regulations, 2003

Environmental Impact Assessment (EIA) is a critical examination of the effects of a project on the environment. The goal of an EIA is to ensure that decisions on proposed projects and activities are environmentally sustainable. An EIA is conducted in order to identify impacts of a project on the environment, predict likely changes on the environment as a result of the development, evaluate the impacts of the various alternatives on the project and propose mitigation measures for the significant negative impacts of the project on the environment. The Project proponent pays for the entire EIA process. Environmental Audit (EA) is the systematic documentation, periodic and objective evaluation of activities and processes of an on-going project. The goal of EA is to establish if proponents are complying with environmental requirements and enforcing legislation. The purpose of EA is to determine the extent to which the activities and programs conform to the approved environmental management plan.

Relevance

This Report complies with the requirements of the Environmental Regulations in the coverage of environmental issues, project details, impacts, legislation, mitigation measures, management plans and procedures. The Proponent shall be required to commit to implementing the environmental management plan laid out in this report and any other conditions laid out by NEMA.

4.1.2.2 Environmental Management and Coordination (Water Quality Regulations of 2006)

Water Quality Regulations apply to water used for domestic, industrial, agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources. The objective of the regulations is to protect human health and the environment. The effective

enforcement of the water quality regulations will lead to a marked reduction of water-borne diseases and hence a reduction in the health budget.

The regulations also provide guidelines and standards for the discharge of poisons, toxins, noxious, radioactive waste or other pollutants into the aquatic environment in line with the Third Schedule of the regulations. The regulations have standards for discharge of effluent into the sewer and aquatic environment. While it is the responsibility of the sewerage service providers to regulate discharges into sewer lines based on the given specifications, NEMA regulates discharge of all effluent into the aquatic environment. Everyone is required to refrain from any actions, which directly or indirectly cause water pollution, whether or not the water resource was polluted before the enactment of the Environmental Management and Coordination (Amendment) Act (EMCA) Gazetted in 2015. It is an offence to contravene the provisions of these regulations with a fine not exceeding five hundred thousand shillings.

Relevance

The proponent shall comply by ensuring all the effluent released during construction and operation of the factory are properly handled to prevent them from polluting the environment. In addition, the proponent shall construct effective ETP for handling and treatment of effluents from the sugar factory. Other compliance will involve applying for effluent discharge licence on annual basis and sampling and analysis of effluents of quarterly basis.

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

General prohibitions of the Act provide that no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others in the environment. Of importance in determining nuisance, the time of day, proximity to residential area, recurrence or intermittence of the noise, level and intensity of the noise and whether the noise can be controlled without much effort or expense to the person making the noise.

The regulations also provide that no person shall cause or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others in the environment, or cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property or 30 meters from any moving source.

Vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others in the environment, or cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property or 30 meters from any moving source.Table 7 below indicates the maximum allowable noise levels for given zones.

Table 7: Permissible outdoor noise levels for residential and other areas

Zone	Sound level limit dB(A) Leq, 14h)		Noise Rating Level (NR) (leq, 14h)	
	Day	Night	Day	Night
Residential indoor	45	35	35	25
Residential outdoor	50	35	45	25
Places of worship	40	35	30	25
Silent zone	40	35	30	25
Commercial	60	35	55	25
Mixed residential (with some commercial and places of entertainment)	55	35	50	25

Day: 6:01 am – 8:00 pm; Night: 8:01 pm – 6:00 am

The regulations however exempt the emission of noise for the purpose of alerting persons to the existence of an emergency.

Relevance

Through the contractor and tenants to the proposed facility, the proponent shall ensure strict adherence to these regulations during the construction and operation phases respectively. Annual environmental audit of the facility will also be carried out to monitor observation of these regulations.

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

The objective is to provide for prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources, including as mobile sources (e.g. motor vehicles) and stationary sources (e.g. industries) as outlined in the Environmental Management and Coordination (Amendment) Act, 2015. It also covers any other air pollution source as may be determined by the Cabinet Secretary in consultation with the Authority. Emission limits for various areas and facilities have been set. The regulations provide the procedure for designating controlled areas, and the objectives of air quality management plans for these areas. The following operations (provided they are not used for disposal of refuse), are exempt from these regulations:

- Back-burning to control or suppress wildfires;
- Firefighting rehearsals or drills conducted by the Fire Service Agencies
- Traditional and cultural burning of savannah grasslands;
- Burning for purposes of public health protection;

Relevance

The proponent is committed to providing the environment against any nuisance related to air emissions. He has proposed to put air pollution control equipment in particular the ESP and to ensure that it meets both efficiency and good environmental performance. The chimney shall be in line with NEMA standards. In addition, the proponent will comply by conducting air quality sampling and analysis and applying for the Emission license from NEMA on annual basis.

4.1.2.5 Environmental Management and Coordination (Waste Management) Regulations, 2006

Part II, 4 (1) of the Regulations states that no person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated receptacle. Regulation 4 (2) further states that a waste generator shall collect, segregate and dispose such waste in the manner provided for under these regulations. Regulation 5 (1) provides for cleaner production methods. It states that a waste generator shall minimize the waste generated by adopting the following cleaner production methods:

a) Improvement of production process through:

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

b) Monitoring the product cycle from beginning to end by:

- Identifying and eliminating potential negative impacts of the product; and
- Enabling the recovery and re-use of the product where possible.

c) Incorporating environmental concerns in the design and disposal of a product.

Relevance

The proponent shall adopt appropriate waste management system throughout the life cycle of the proposed project including hiring services of licensed waste collectors and transporters and disposal at licensed sites.

4.1.3 The Traffic Act, 2012

The Traffic Act, 2012 gives provisions and guidelines that govern the Kenya roads transport sector. These guidelines are essential to private, public and commercial service vehicles in ensuring safety and sanity on the roads hence ensuring the environment; the human being a component is safeguarded. In section 41 The Act demands for installation and certification of speed governors for the commercial vehicles ferrying goods adjusted to the loading condition of such vehicles to a limit of 80 KPH, registration and competence of drivers. Moreover, the owner of commercial vehicles or trailer shall ensure clear markings on their vehicles in English

language on the right side of the vehicle showing ownership details, tare weight of vehicle and maximum authorized weight.

Section 26 and 27 of the same discourages engines that emit exhaust gases to the atmosphere without passing via a silencer or expansion chamber. In ensuring safety of all the persons in transit section 56 encourages that every public and commercial vehicle be fitted with inspected and first class first aid box and fire extinguisher.

Relevance

In ensuring compliance to this Act the contractor and developer shall ensure that all site drivers and all material suppliers to the site satisfy the provisions as stipulated in Act. The proponent shall enforce this act by ensuring all other vehicles of the company do not exceed speed limits and observe the rules at all times.

4.1.4 Public Health Act (Cap. 242)

Part IX, section 115, of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires that Local Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health.

Relevance

The Proponent undertakes to safeguard the environment ensuring that all solid waste or waste water effluent emanating from the proposed project is discharged appropriately so as not to cause pollution or nuisance or be injurious to the neighbours.

4.1.5 Water Act, 2016

The Water Act in section 3 vests every water resource in the state subject to any rights granted by or under the water Act or any other written law. The Act in Section 25 provides that a permit shall be required for any use of water from a water resource, especially where there is abstraction and use of water with the employment of works. Permits are also required for the drainage of any swamp or other land; and the discharge of a pollutant into any water resource. Section 26 of the act gives exclusions for which no permit is required like for the abstraction or use of water, without the employment of works, from or in any water resource for domestic purposes by any person having lawful access thereto. Section 7 of the Act establishes Water Resources Management Authority (WRMA) whose powers and functions as far as the administration of the Act is concerned, are stated in section 8.

The Water Act, 2016 also provides for establishment of 3 levels of institutions for the provision of services. These are:

- Water Services Regulatory Board (WSRB);
- Water Services Boards (WSB); and

- Water Service Providers (WSP).

Relevance

The proponent shall obtain all the permits for use of water from the Water Resources Authority prior to abstraction and use.

4.1.6 The Energy Act 2019

The Energy Act, amongst other issues, deals with all matters relating to all forms of energy including the generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes. The Energy Act, 2006 established the Energy Regulatory Commission (ERC) now EPRA whose mandate is to regulate all functions and players in the Energy sector. One of the duties of the EPRA is to ensure compliance with Environmental, Health and Safety Standards in the Energy and Petroleum Sector, as empowered by the Energy Act.

Part IV (2) states that the Cabinet Secretary may in conjunction with relevant agencies perform such functions and exercise such powers as may be necessary under this Act to promote the development and use of renewable energy, including but not limited to—

(g) promoting the utilization of renewable energy sources for either power generation or transportation;

(i) promoting co-generation of electric power by sugar millers and sale of such electric power through the National Grid directly to the consumers

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

1. The need to protect and manage the environment, and conserve natural resources;

2. The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.

PART VI section 117 provides that a person who wishes to carry out the generation, exportation, importation, transmission, distribution and retail supply of electricity must apply for a licence as the case may be to the Authority in accordance with the provisions of this Act. Provided that a person shall not require any authorization to generate electrical energy for own use of a capacity not exceeding one megawatt.

The act stipulates that the EPRA shall, before issuing a permit take into account all relevant factors including the relevant government policies and compliance with Environment Management and Coordination Act, 1999 and in particular EIA report as per Impact Assessment and Audit Regulations 2003, the Physical Planning Act, 1996 and the Local Government Act.

The Authority is responsible for the adoption and implementation of measures to conserve energy and improve efficiency in harnessing, processing, conversion, transportation, storage of energy, cogeneration, heat recovery and in the use of energy in all consumer sectors.

It is an offence to construct any facility defined in section 107 without obtaining a construction permit.

In addition, Part VI on electrical Energy Licensing section 118 states that a person who carries out any electricity undertaking without a licence commits an offence and shall, on conviction, be liable to a fine of not less than one million shillings or to a term of imprisonment not less than one year or to both such fine and imprisonment.

Relevance

The proponent shall follow this act to the latter and ensure Licensing and authorization to generate and/or transmit electrical power from the proposed Cogen power plant is done from EPRA, supported by an Environmental Impact Assessment Report (EIA) approved by NEMA.

4.1.7 The Land Act, 2012

This is an ACT of Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land based resources, and for connected purposes. The Land Act of 2012 subsection (1) states that 'any land may be converted from one category to another in accordance with the provisions of this Act or any other written law.' it continues to state in subsection (2) that Without prejudice to the generality of subsection (1)

a) Public land may be converted to private land by alienation

b) Subject to public needs or in the interest of defence, public safety, public order, public morality, public health, or land use planning, public land may be converted to community land.

c) private land may be converted to public land by
   i. Compulsory acquisition;
   ii. Reversion of leasehold interest to Government after the expiry of a lease; and
   iii. Transfers; or
   iv. Surrender.

d) Community land may be converted to either private or public land in accordance with the law relating to community land enacted pursuant to Article 63(5) of the Constitution.

It is important to note that any substantial transaction involving the conversion of public land to private land shall require approval by the National Assembly or county assembly as the case may be.

Part I of the same Act states that title to land may be acquired through—

a) allocation;
b) land adjudication process;
c) compulsory acquisition;
d) prescription;
e) settlement programs;
f) transmissions;

g) transfers;
h) long term leases exceeding twenty-one years created out of private land; or
i) any other manner prescribed in an Act of Parliament.

Part viii of this ACT provides procedures for compulsory acquisition of interests in land. Section 111 (1) States that if land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The Act also provides for settlement programmes. Any dispute arising out of any matter provided for under this Act may be referred to the Land and Environment Court for determination.

Relevance

Land for the proposed project is privately owned by the developer and a and sale agreement is attached in this report. There will be further land acquisition for the proposed development as enough land is already available and set aside for this project. In case of such, proper procedure shall be followed.

4.1.8 The Registration Act, 2012

The Land Registration Act is place to revise, consolidate and rationalize the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes. This Act applies to Subject to section 4, this Act shall apply to:

Registration of interests in all public land as declared by Article 62 of the Constitution;

- Registration of interests in all private land as declared by Article 64 of the Constitution; and
- Registration and recording of community interests in land.

Section 24 states that: (a) the registration of a person as the proprietor of land shall vest in that person the absolute ownership of that land together with all rights and privileges belonging or appurtenant thereto; and (b) the registration of a person as the proprietor of a lease shall vest in that person the leasehold interest described in the lease, together with all implied and expressed rights and privileges belonging or appurtenant thereto and subject to all implied or expressed agreements, liabilities or incidents of the lease.

4.1.9 The Environment and Land Court Act, 2011

This Act is in place to give effect to Article 162(2) (*b*) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes.

This Act shall of great essence to the proponent, public, interested or affected party that may want to litigate against the development on settlement issues, location of project or even effects of the project to the public

4.1.10 The National Land Commission Act, 2012 (No. 5 of 2012)

Section 5 of the Act outlines the Functions of the Commission, pursuant to Article 67(2) of the Constitution as follows 5(1):-

- To manage public land on behalf of the national and county governments;
- To recommend a national land policy to the national government;
- To advise the national government on a comprehensive programme for the registration of title in land throughout Kenya;
- To conduct research related to land and the use of natural resources, and make recommendations to appropriate authorities;
- To initiate investigations, on its own initiative or on a complaint, into present or historical land injustices, and recommend appropriate redress;
- To encourage the application of traditional dispute resolution mechanisms in land conflicts;
- To assess tax on land and premiums on immovable property in any area designated by law; and
- To monitor and have oversight responsibilities over land use planning throughout the country.

Relevance: *The proponent commits to conduct all due diligence on matters of land ownership for the proposed development*.

4.1.11 The Building Code 2000

The building code under Septic and conservancy tanks, section 202 allows for installation of septic tanks where a sewer system has not been provided that the proponent abides with the provisions under the set table. The area where the project is to be located is not supported by a sewer line.

Relevance: *The proponent shall design an effluent treatment plant intended to serve the factory*.

4.1.12 Occupational Safety and Health Act (OSHA 2007)

This is an Act of Parliament to make provision for health, safety and welfare of persons employed in factories and other places, and for matters incidental thereto and connected therewith.

Building Operations and Works of Engineering Constructions

The provisions of the Factories and Other Places of Work Act relevant to engineering construction works are contained in the Abstract of the Act for Building Operations, and Works of Engineering Construction Rules. These are summarized in Table 8 below.

Table 8: Summary of Building Operations, and Works of Engineering Construction Rules

Legal Requirements	**Description**
General Requirements	
Give notice of particular operations or Works	Notice should be sent in writing to the Occupational Health and Safety Officer, not later than seven days after commencement of construction and building works except where the construction works will be complete in less than six weeks or notice had already been given to the Occupational Health and Safety Officer (Section 60 of the Act).
General Register	A general register of every person undertaking building operations or construction works is kept in adherence to the prescribed form L.D.B.C.R.2. This register is kept at the site of operations or at the office of the person undertaking the operations or works. The register should contain: • The certificate of registration of the workplace; • Every other certificate issued by the Chief Inspector under this Act; • The prescribed particulars as to the finishing (washing, white washing, colour washing, painting or varnishing) of the facility; • The prescribed particulars as to every accident and case of occupational disease occurring in the workplace of which a notice is required to be sent to a labour officer under the provisions of any law for the time being in force; • All reports and particulars required by any other provision of this Act to be entered in or attached to the general register; • Such other matters as may be prescribed (Section 62 of the Factories and Other Places of Work Act).

Special rules and welfare	Printed copies or prescribed abstracts of the Factories and Other Places of Work Act must be kept posted at the site of operations or works (Section 61 of the Factories and Other Places of Work Act).
Safety Requirements	
Air receivers	These should be of sound construction and be properly maintained. They should be thoroughly examined by a competent person at intervals of 24 months and the reports of such examinations attached to the General Register (Section 39 of the Factories and other Places of Work Act).
Cylinders for compressed, liquefied and dissolved gases	Such cylinders should be of good construction, sound material, and adequate strength and free from patent defect. The cylinders should conform to standards specified under the Standards Act or to a prescribed standard specification, approved in writing, by the Director, Kenya Bureau of Standards. They should be thoroughly examined by a competent person at regular intervals and a maintenance register kept (Section 39A of the amendment of the Factories and Other Places of Work Act).
Notification of accidents	The particulars of an accident-causing death or disablement of a worker for more than three days from earning full wages at the work place where he was employed must be sent in the prescribed form (L.D.B.C.R) 6) to the Occupational Health and Safety Officer and entered in the General Register. Certain dangerous occurrences must also be reported whether or not they cause disablement (Section 62 of the Factories and Other Places of Work Act).
Health Requirements	
Sanitary accommodation	Sufficient and suitable sanitary conveniences must be available for persons employed. These must be kept clean and well lit (Sections 16 and 18 of the Factories and Other Places of Work Act).
Miscellaneous Requirements	

Prohibition of deduction from wages	The occupier must not make a deduction from wages in respect of anything he has to do or provide in pursuance of the Factories Act or permit any person in his employment to receive payment from other employees for such services (Section 66 of the Factories and Other Places of Work Act).
Duties of persons employed	An employee must not wilfully interfere with or misuse any means, appliance, convenience or other thing provided in pursuance of the Act for securing health, safety or welfare provided for his use under the Act. He must not wilfully and without reasonable cause do anything likely to endanger himself or others (Section 65 of the Factories and Other Places of Work Act).
Inspection	The Occupational Health and Safety Officer has the power to inspect every part of the premises by day or by night. He may require the production of registers, certificates and other papers. May examine any person alone or in the presence of any other person as he thinks fit and may require him to sign a declaration of truth of the matters about which he is examined. Every person obstructing an Occupational Health and Safety Officer is liable to a penalty (Section 69 of the Factories and Other Places of Work Act).

Medical Examination Rules

These are described in Legal Notice No. 24 of the Kenya Gazette Supplement No. 22 of April 2005. The Medical Examination Rules apply to all those employees in employment or who have been in employment in every workplace to which the provisions of the Factories and Other Places of Work Act (Cap 514) apply. The Rules describe the following:

- Occupations requiring medical examination;
- Duties of employer and employees with regard to medical examination;
- Reports on examination;
- Certificate of redeployment;
- Certificate of fitness;
- Notification of occupational diseases; and
- Offences and penalties.

Relevance*: The proponent shall register the proposed factory as a work place. In addition, the proponent will follow all the requirements including conducting trainings, OSH audits and other statutory requirements under DOSHS.*

4.1.13 Physical Planning Act (Cap 286)

An Act of Parliament to provide for the preparation and implementation of physical development plans and for connected purposes enacted by the Parliament of Kenya Under this Act, no person shall carry out development within the area of a local authority without a development permission granted by the local authority under section 33. The local authority concerned shall require the developer to restore the land on which such development has taken place to its original condition within a period of not more than ninety days. If on the expiry of the ninety days' notice given to the developer such restoration has not been effected the concerned local authority shall restore the site to its original condition and recover the cost incurred thereto from the developer.

Relevance*: The developer shall ensure the final drawings for the proposed development are approved by the relevant departments of County Government of Narok.*

4.1.14 Employment Act No 11 of 2007

The Act is enacted to consolidate the law relating to trade unions and trade disputes, to provide for the registration, regulation, management and democratization of trade unions and employers organizations and federations. Its purpose is to promote sound labour relations through freedom of association, the encouragement of effective collective bargaining and promotion of orderly and expeditious dispute the protection and promotion of settlement conducive to social justice and economic development for connected purposes. This Act is important since it provides for employer – employee relationship that is important for the activities that would promote management of the environment within the housing sector. The developer, the contractor and the employees' relationship during the construction and later phases of this project shall be guided by this Act.

Relevance: *This ACT shall provide necessary guidance to the employer and the employees of the proposed project in all phases of the project.*

4.1.15 Penal Code Cap 63

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

Relevance: *The proposed project shall protect the environment and shall engage in environmental protection activities and initiatives. The management shall create awareness to all its employees against causing any form of pollution to water sources.*

4.1.16 The Factory and Other Places of Work Act Cap 514 of 2005

This act governs noise prevention and control and in section 4 (1) it sets limits of how much noise a worker may be exposed to (a) as the continuous equivalent of ninety dB (A) in eight hours within any twenty-four hours duration; and (b) one hundred and forty dB (A) peak sound level at any given time. Section (3) adds that where noise is intermittent, noise exposure shall not exceed the sum of the partial noise exposure equivalent continuous sound level of ninety

dB (A) in eight-hour duration within any twenty four hours duration. It also places the duty of ensuring an effective noise control and hearing conservation programme on occupiers in section 5, which the act states in subsection 5 (2) to include:

a) Noise measurement;
b) Education and training;
c) Engineering noise control;
d) Hearing protection.
e) Posting of notices in noisy areas;
f) Hearing tests; and
g) Annual programme review.

The act places responsibility of recording noise levels at workplaces and reporting to the Director of Occupational Safety and Health on occupiers and in Section 10 (1) it states that machinery or plant in the workplace should be installed in such a way that the lowest possible noise is emitted when the machine is in operation. In section 12 it states that where measures to segregate noisy areas (beyond 90 dB(A)) are not feasible then occupiers should provide workers with adequate PPEs.

Relevance: *The proponent shall comply by ensuring the law is followed and provide adequate PPEs to all his workers. All employees Shall be protected against all potential harm while at work.*

4.1.17 The National Construction Authority Act, 2011

This act establishes the national construction authority, a state corporation under the Public Works Ministry. The authority is mandated to regulate and aid development of the construction industry through registration and accreditation of contractors, skilled construction workers and construction site supervisors and regulate their activities. It is also mandated to monitor the construction process as detailed in the Physical Planning Act.

Relevance: *Before construction commences, the proponent shall ensure that any hired contractors are registered by this authority. The project shall fully comply with the requirements of NCA during construction.*

4.1.18 County Governments Act, 2012

This Act vests responsibility upon the County Governments in planning of development projects within their areas of jurisdiction be it projects of importance to the local County government or those of national importance. Section 102 of the Act provides the principles of planning and development facilitation which include integration of national values in county planning, protect the right to self-fulfillment within the county communities and with responsibility to future generations, protection of rights of minorities and marginalized groups and communities, promotion of equity resource allocation, among others. Section 103 of the Act outlines the prime objective of county planning which aligned to the bill of rights and the constitution of Kenya.

Section 114 and 115 indicate and give guidelines in planning of projects of national significance and instill the aspect of public participation in every aspect of the planning process through

that: clear strategic environmental assessments; clear environmental impact assessment reports; expected development outcomes; and development options and their cost implications. Each county assembly is tasked with the role to develop laws and regulations giving effect to the requirement for effective citizen participation in development planning and performance management within the county.

Relevance: *The project proponent has informed the respective county government officials through the stakeholders engagement and committed to initiate the process of comploiance with relevant Narok County Government departments through application of essential development approvals.*

4.1.19 Sexual Offences Act (No. 3 of 2006)

The Sexual Offences Act, No.3 2006 aims to make provision about sexual offences, their definition, prevention and the protection of all persons from harm from unlawful sexual acts, and for connected purposes.

Relevance: *The proponent shall put in place all mechanism to discourage unlawful sexual acts in the entire project life, these includes massive awareness.*

4.2 Policy Framework

4.2.1 Environmental policy framework

The Kenya Government's environmental policy is geared towards sound environmental management for sustainable development. This is envisaged in the principle of prudent use, which requires that the present day usage should not "compromise the needs of the future generations".

The policy emphasis is on environmental protection in order to ensure sufficient supplies for the present and future generations. The policy envisages the use of the "polluter pays principle", where one is expected to make good any damage made to the environment.

The Kenya Government's environmental policy aims at integrating environmental aspects into national development plans. The broad objectives of the national environmental policy include:

- Optimal use of natural land and water resources in improving the quality of human environment;
- Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations;
- Integration of environmental conservation and economic activities into the process of sustainable development; and
- Meet national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

4.2.2 Kenya's Vision 2030

Kenya Vision 2030 is the country's new development blueprint covering the period 2008-2030. It aims to transform Kenya into a newly industrialising, ''middle income country providing a high quality life to all its citizens by the year 2030''. The vision was developed through an all inclusive and participatory stakeholder consultative process, involving Kenyans from all parts of the country

The Vision 2030 is based on 3 key pillars; Economic Pillar, Social Pillar, and Political Pillar. The economic, social and political pillars of Kenya Vision 2030 are anchored on the following foundations: macroeconomic stability; continuity in governance reforms; enhanced equity and wealth creation opportunities for the poor; infrastructure; energy; science, technology and innovation (STI); land reform; human resources development; security and public sector reforms.

The 2030 goal for equity and poverty elimination is to reduce the number of people living in absolute poverty to the tiniest proportion of the total population. The initiative aims to expand access across different social and political dimensions, including: widening coverage of "essential health care"; equitable distribution of water, sewerage and sanitation services; improvements in public transport; and attaining gender parity and fairness in the delivery of justice. Reducing social inequalities, in short, cuts across all the economic and social initiatives proposed by Vision 2030.

4.2.3 The Sugar Policy

The Sugar policy as established is in line with the national objectives of the national food policy, which are; self-sufficiency, 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, and creating employment and foreign exchange savings. It is an industry valued at approximately Kshs. 15 billion, providing over 500,000 direct and indirect jobs and supporting the livelihoods of over 6 million people.

4.2.4 The National Land Policy

The National Land Policy adopted by the cabinet as Sessional Paper No. 3 of 2009, acknowledges environmental problems faced by Kenya. These include degradation of natural resources such as forests, wildlife, water, marine and coastal resources as well as soil erosion and the pollution of air, water and land. In its section 129 the policy provides for ecosystem protection, urban environment management, environmental assessment and audits to be undertaken to conserve and manage the environment.

Relevance: *The proponent shall protect the environment and shall be required to conduct annual environmental audits.*

4.3 Institutional and administrative framework

The environmental institutional and administrative frameworks have been established by EMCA 2015 Amendment and include the following.

4.3.1 National Environment Management Authority (NEMA)

The responsibility of the National Environmental Management Authority (NEMA) is to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment. In addition to NEMA, the Act provides for the establishment and enforcement of environmental quality standards to be set by the Cabinet Secretary in consultation with the Authority, which will govern the discharge, limits to the environment by the proposed project.

The proponent will acquire NEMA EIA license prior to commencing any development at the proposed site.

4.3.2 National Environmental Tribunal

The National Environment Tribunal (NET) is created under Section 125 of the Environmental Management and Coordination Act (EMCA) of 1999. Its functions are:

- To hear and determine appeals from NEMA's decisions and other actions relating to issuance, revocation or denial of Environmental Impact Assessment (EIA) licences or amount of money to be paid under the Act and imposition of restoration orders;
- To give direction to NEMA on any matter of complex nature referred to it by the Director General.

4.3.3 Land and Environment Court

This is established as a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes. Section 13 (2) (b) of the Land and environment Court Act outlines that in exercise of its jurisdiction under Article 162 (2) (b) of the Constitution, the Court shall have power to hear and determine disputes relating to environment and land.

Relevance: *The proponent shall be guided accordingly in case of any land acquisition in the future and shall follow the set procedures.*

4.3.4 County Government of Narok

It constitutes various developmental approvals departments such as the planning department. The project proponent presented the project drawings and plans to the department for approval prior to the project implementation. *The proponent will be required to circulate the plans to the designated approving departments prior to development.*

4.3.5 Ministry of Agriculture, Livestock and Fisheries

The overall function of the ministry is to enhance production of crops, livestock and fisheries, marketing and processing. The Ministry has also the mandate to provide development and extension services to smallholder farmers through its extension department.

The functions of the ministry are as follows:

- Formulate, implement and monitor legislations, regulations and policies;
- Provide extension services;
- Support research and promote technology delivery;

- Facilitate and represent agricultural state corporations in the government;
- Develop, implement and coordinate programmes in the agricultural sector;
- Regulation and quality control of inputs, produce and products from the agricultural sector;
- Management and control of pests and diseases;
- Promote management and conservation of the natural resource base for agriculture; and
- Collect, maintain and manage information on the agricultural sector.

Relevance: *The proponent shall work closely with this department to ensure extension services reach the sugarcane farmers.*

4.3.6 Kenya Sugar Board (Kenya Sugar Act (2001)

The KSB acts as a technical unit to advise the Ministry in promoting all aspects of producing, processing and marketing of sugar cane, sugar and molasses. The KSB also advises on pricing and necessary legislation for the industry. Kenya Sugar Board (KSB) is a public body set up by the Sugar Act of 2001 under the Ministry of Agriculture. The Board succeeded the Kenya Sugar Authority, now defunct, and is mandated to:

- regulate, develop and promote the sugar industry
- co-ordinate the activities of individuals and organizations within the industry
- facilitate equitable access to the benefits and resources of the industry by all interested parties

A sugar development levy of 7% of the market price is charged by the Kenya Government on all sugar sales. This levy is collected by the Kenya Revenue Authority and is managed by KSB. The levy comprises the following:

- Cane Development 2%
- Infrastructure 1%
- Factory Rehabilitation 3%
- Grants to Research 0.5%
- KSB Administration 0.5%

The setting up of a single regulatory body, the Kenya Sugar Board (KSB) ensures that investors get a single source of investment advice on the sector. The sugar companies operate under the umbrella of the Kenya Sugar Board, which is a public body charged with the responsibility of promoting and fostering the effective and efficient development of sugar cane for production of white sugar. KSB is also charged with the mandate of regulating the sector and ensuring the country is self-sufficient in white sugar production.

Relevance*: The proponent shall comply by applying and acquiring license from the Kenya sugar board before establishing the factory.*

4.3.7 The Wildlife Conservation and Management Act, 2013

This Act became operational on 10 January 2014. One of its guiding principles is the devolution of conservation and management of wildlife to landowners and managers in areas where wildlife occurs, through in particular the recognition of wildlife conservation as a form of land-use, better access to benefits from wildlife conservation, and adherence to the principles of sustainable utilization. Section 25 of the act provides for compensation for injuries and damages caused by wildlife (species listed in its third schedule) to humans and their properties respectively. Such compensation claims are to be reviewed and awarded by County Wildlife Conservation and Compensation Committees at the ruling market rates: provided that no compensation shall be paid where the owner of the livestock, crops or other property failed to take reasonable measures to protect the properties from damage by wildlife or land use practices are incompatible with the ecosystem-based management plan for the area.

The act in its sixth schedule list various animal and tree species that are nationally considered as critically endangered, vulnerable, nearly threatened and protected. It also lists in its seventh schedule, national invasive species for which control is required.

Section 48 restricts activities involving the above listed species without a permit from KWS. KWS can make recommendations to the responsible cabinet secretary, to prohibit carrying out of any activity which: is of a nature that may negatively impact on the survival of species listed in sixth schedule; or is specified in the notice or prohibit the carrying out of such activity without a permit issued by KWS.

Part IX of the act deals with the management of human-wildlife conflicts. It provides for handling of problem animals by land owners/occupiers or their agents.

Relevance: *Any critically endangered, vulnerable, nearly threatened or protected species found within the project area will have to be managed in line with this Act. Further, management of any human-wildlife conflicts arising from the project implementation will also be guided by this act*

4.3.8 Agriculture, Fisheries and Food Authority Act, No. 13 of 2013

This is an Act of Parliament to repeal the agriculture Act, Cap 318 to align with the new constitution. The Act abolishes some of the institutions created under the repealed agriculture act like KEPHIS and PCPB. It has replaced them with Agriculture, Fisheries and Food Authority. The Authority shall, in consultation with the county governments, perform the following functions:

3.10.1.1 Administer the Crops Act, and the Fisheries Act in accordance with the provisions of these Acts;

3.10.1.2 Promote best practices in, and regulate, the production, processing, marketing, grading, storage, collection, transportation and warehousing of agricultural and aquatic products excluding livestock products as may be provided for under the Crops Act, and the Fisheries Act.

3.10.1.3 Collect and collate data, maintain a database on agricultural and aquatic products excluding livestock products, documents and monitor agriculture through registration of players as provided for in the Crops Act and the Fisheries Act;

- Be responsible for determining the research priorities in agriculture and aquaculture and to advise generally on research thereof;
- Advise the national government and the county governments on agricultural and aquatic levies for purposes of planning, enhancing harmony and equity in the sector; and
- Carry out such other functions as may be assigned to it by this Act, the Crops Act, the Fisheries Act and any written law while respecting the roles of the two levels of governments.

Relevance: *This piece of legislation is practical in this project since it will be subject to management and operational decisions made by the ministry of Agriculture, Livestock and Fisheries and the newly established Agriculture, Fisheries and Food Authority.*

4.3.9 Food Drugs and chemicals substances Act (Cap 254

The Food, Drugs and Chemical Substances Act (CAP 254) whose purpose is to make provisions for the prevention of adulteration of food, drugs and chemical substances. This Act (which has been invoked for the consumption of genetically modified food), requires that food, drugs, cosmetics, devices and chemical substances should not be sold if they are unwholesome, poisonous, or adulterated. It further prohibits deceptive labelling. The statute also gives powers to authorized officers to inspect and examine any premises for evidence of contravention of the provisions of the law.

Relevance: *The sugar plant should be regularly inspected by the public health officer and issued with a Food Drugs and chemicals substances license*.

4.3.10 The Pest Control Products Act (Cap 346)

This is an Act of Parliament that 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.

Section 2 of the Act refers to "pest control product" as " a product, device, organism, substance or thing that is manufactured, represented, sold or used as a means for directly or indirectly controlling, preventing, destroying, attracting or repelling any pest and includes-

a) any compound or substance that enhances or modifies or is intended to enhance or modify the physical or chemical characteristics of a pest control product to which it is added; and

b) any active ingredient used for the manufacture of a pest control product;"

Relevance: *Since the sugarcane farming will be aimed at improving the quality, quantity and variety of output from the project area, there are bound to be numerous sugarcane crop enhancement and protection activities by the proponent and farmers through use of pesticides and other soil-enriching chemicals. The relevant provisions in the Act will thus play an integral role in regulating the use of such products during operational phase of the project. It is therefore, vital that this legislation is granted requisite attention in the entire course of the project*

4.4 International Conventions

4.4.1 The 1985 Vienna Convention for the Protection of the Ozone Layer

Intergovernmental negotiations for an international agreement to phase out ozone depleting substances concluded in March 1985 with the adoption of the Vienna Convention for the Protection of the Ozone Layer. This Convention encourages intergovernmental cooperation on research, systematic observation of the ozone layer, monitoring of CFC production, and the exchange of information. The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in September 1987, and was intended to allow the revision of phase out schedules on the basis of periodic scientific and technological assessments. The Protocol was adjusted to accelerate the phase out schedules. It has since been amended to introduce other kinds of control measures and to add new controlled substances to the list.

4.4.2 The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer

This Protocol was drawn to cut down on the production and consumption of ozone depleting substances in order to reduce their abundance in the atmosphere, and thereby protect the earth's fragile ozone Layer. The Parties to the Montreal Protocol have amended the Protocol to enable, among other things, the control of new chemicals and the creation of incentive measures to enable developing countries to comply. The project envisages use air conditioning equipment. Coolants used should be those of none ozone depleting components as required by NEMA

4.4.3 The 1992 United Nations Framework Convention on Climate Change (UNFCCC)

The primary purpose of the convention is to establish methods to minimize global warming and in particular the emission of the greenhouse gases. The UNFCCC was adopted on 9th May 1992and came into force on 21st March 1994. The Convention has been ratified by 189 states. Kenya ratified the Convention on 30th August 1994. NEMA is the focal point for the Convention. The fuel used by the power back-up generator should be friendly to the environment and approved by the energy regulatory body, Energy and Petroleum Regulatory Authority (EPRA).

CHAPTER FIVE

PUBLIC PARTICIPATION AND STAKEHOLDERS' CONSULTATION

5.1 Overview.

Public participation and Stakeholders Consultation in ESIA is a systematic way of involving the public and stakeholders in the planning, development and decision-making process. Public participation aims at improving project design, environmental soundness and social acceptability. It provides opportunity for public involvement in scoping, ESIA review and monitoring.

5.2 Stakeholder's Identification/Mapping

The team engaged stakeholders in a forum held at Narok town on **23rd March 2023**. The experts ensured that the stakeholders identified are multi-sectorial touching on agriculture, water, security, gender, health, Safety, Environment, roads and human resource. These stakeholders were consulted by use of stakeholders meeting where presentations, interviews, questions and answers method were used. To ensure that no major player is left out, a desk top study/mapping was done to determine relevant stakeholders to the project. Members of the public were mobilized and called to attend two major forums in two different sublocations.

Table 9: Illustration of Stakeholders identified and their roles and interests

Department	Particulars	Roles and Responsibilities	Interest
Agriculture, Livestock and Fisheries	Hon. Joyce T. Keshe - CECM Livingstone Chepukel- CO	• County policies and plans • Extension services to farmers • Food security and agribusiness development.	Focus to alleviate food insecurity and poverty
Water Resources Authority	Joshua O. Osio-Sub regional manager	• Management of water resources • Providing guidelines and procedures for the allocation of water resources; • Determines applications of permits for water use;	-Water conservation -Pollution prevention -Ensuring equitable access to all and prevent over abstraction -Permitting

		• Regulates and protects water resources quality from adverse impacts; • Manages and protects water catchments; • Determines charges to be imposed for the use of water from any water resource	
Directorate of Occupational Safety and Health	Kelvin Purko	Ensure the workplace is free of any hazards, and complies to laid down standards to assure safety of employees.	Ensure workplace Registration
Public Works, Roads & Transport (NCG)	HON. John Gatua-CECM	Issues touching on roads	Expansion of roads
Ministry of Interior and Coordination of National Government	Samuel Seitai. (Senior chief)	Maintaining security, law and order	Ensure security and any arising grievances are taken care of.
National Environment Management Authority	Mr. Fanuel Mosago-CDE Nema	Environmental Impact Assessment (EIA) is conducted and a license for project implementation is issued prior to construction	Ensure all project impacts are successfully mitigated against.
Health and Sanitation	Anthony Namunkuk-CECM	• Implementing laws and regulations that secure health and ensure safety. • Prevent the spread of communicable disease. • Protect against environmental health hazards. • Issues of waste and wastewater management	Encourage community partnerships and action to identify and resolve health related issues
Trade	Johnson Palmeris	• Issues of trade • Organization of farmers into cooperatives	Implication of project on trade

Narok County Assembly	Leina Morintat-MCA for the Proposed project area Duncan Bore-MCA	Representing the area residents	Representing the interests of the locals in the proposed project
Public Service Management & Labour	Josephine Chepngétich Ngeno (Representing the Chief officer)	Issues of labor at workplace	Ensure issues touching on labor are incorporated in the project
Dept of ICT and E-government	Linus Nairimo-CECM	ICT issues	ICT issues

5.3 Methodology of Public Participation and Stakeholders engagement

The stakeholders are categorized into two groups of primary stakeholders and secondary stakeholders. Primary stakeholders are the beneficiaries of a development intervention or those directly affected (positively or negatively) by the project. They included local populations (individuals and community-based organizations) in the project/program area.

Secondary stakeholders are those who influence development intervention or are indirectly affected by it. They include the proponent, national government and county line ministry or departments and implementing agencies. The consultation programme was developed and implemented taking into account the various areas of influence.

The members of the public were involved in this ESIA process. Views from the 'would be affected' people were sought from the community through 2 different Public Barazas held on **9th March 2023** and 17**th February 2023.** In attendance were **51** and **38** participants in the two different meetings. Both Public Participation exercise were chaired by the area MCA and area senior chief respectively. The data collection was carried out through structured questionnaires where **50 questionnaires** were administered, filled and returned and another set of **38 questionnaires** filled during the second public participation. (*Both attendance lists annexed)*

5.4 Consultation Process

The exercises were conducted by registered and licensed environmental experts. The objective of the consultation and public participation was to:-

- Disseminate and inform the stakeholders about the project with special reference to its key components and location
- Gather comments, suggestions and concerns of the interested and affected parties
- Propose solutions and mitigation measures to the various concerns
- Incorporate the information collected in the ESIA study

In addition, the Environmental Impact Assessment public consultation exercise enabled: -

a) The establishment of a communication channel between the general public and the Lead Expert, the project proponents and the Government.
b) The concerns of the stakeholders to be known to the decision-making bodies at an early phase of project development

The purpose for such interviews was to identify the positive and negative impacts and subsequently promote and mitigate them respectively. It also helped in identifying any other miscellaneous issues which may bring conflicts in case project implementation proceeds as planned.

The Consultation and Public Participation (CPP) Process is a policy requirement by the Government of Kenya and a mandatory procedure as stipulated by EMCA 1999 section 58, on Environmental Impact Assessment for the purpose of achieving the fundamental principles of sustainable development.

Figure 5.4: The Area Chief addressing the residents during public participation at the proposed project site at Esaie and and olengoloto sublocations. The third photo shows the residents raising hands in support of project during public participation forum held at Olengoloto primary school.

5.5 Issues raised by the community during public Participation

(a) Employment and Job Opportunities

The locals of both Esaie and Olengoloto, especially the youths were keen to find out if there are any employment opportunities reserved for them both during and after the factory construction.

The consultant assured the locals that they will be given first priority in job distribution during construction. Only skills that will not be available from the project area will be sourced from outside. They were also assured that locals will be the main beneficiaries during operation and of the project in terms of employment.

(b) Access to sugar factory and minimization of losses

The residents of Olmismis sought to know how the company will address the issues of delay in sugarcane harvesting being experienced currently in Transmara West and payment of farmers. The proponent replied that all farmers will be paid after two weeks from the day of harvest and that having the factory close to farmers, canes will be harvested in time since no long distance to be travelled that has been causing such delays.

(c) Influx of new people in the area, Conflicts and Grievances

A resident of Esaie area was concerned about population increase and new people in the area as a result of workers directly employed at the factory and persons engaged in other activities related to sugar processing. He pointed out complaints from the residents may increase and wanted to know the mitigation measures in place.

The Consultant replied that the company together with the local leadership will form a grievance redress mechanism to address any project related issues that may arise. He pointed out that a GRM committee will be constituted must have a representative from the client's side, the chief and village elders among others. A sociologist will also be appointed by the client for purposes of social safeguards.

(d) Air pollution related issues

Air pollution was identified as a major impact. During operation phase, it was identified that the sugar factory is likely to emit air pollution such as sulfur dioxide, carbon monoxide and nitrogen oxide that can be a nuisance. The expert explained that proper stack emission control measures has been incorporated in the project design to ensure emissions are trapped and no harmful emissions will be allowed to escape.

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. Other measures to be put in place shall include: Air quality sampling and analysis will be done as per NEMA standards, Technology to include electrostatic precipitator system

to mitigate on air pollution, plant trees around the factory will help absorb carbon dioxide, excess bagasse will be recycled to produce energy and not left to rot.

(e) Bagasse management

The community wanted to know how bagasse will be managed. The experts replied that first, the excess bagasse which comprised a major form of solid waste from the process (120 Tonnes) will be stored and used in the Co-gen power plant to generate electricity (1 MW). Power generation will consume approximately 66% of the bagasse generated. The remaining 36% will not be a problem as a proposal is in place that it will be added to filter mud and used as fertilizer.

(f) Source of water for the factory

The consultant informed the residents that the ground water potential mapping indicated that the area had enough water for drilling boreholes or constructing a dam. Residents indicated that there was a community dam and spring nearby from where water can be abstracted but were not sure of its sustainability if the factory will abstract from there. The proponent representative responded that in order to safeguard the existing sources of water, they are planning to do two boreholes and a similar dam for factory use and can as well be shared by the community.

(g) Dust Generation

During dry weather, the participants expressed concern over possibility of generation of large amounts of dust within the project site and surrounding areas as a result of excavation works and transportation of building materials. The expert responded that proponent will ensure that dust levels at the site are minimized through sprinkling water in areas being excavated and along the tracks used by the transport trucks within the site.

(h) Management of wastewater

The issue of wastewater management was also debated and the community expressed their interest in how the effluent generated by the sugar factory will be managed. Together with the expert, they recommended that the proponents should consider an efficient effluent treatment method during their planning. The proponent replied and assured them that the factory design will incorporate a modern ETP for this purpose.

(i) Corporate Social Responsibility (CSR)

Roads were pointed out as a major challenge hindering movements in the area. The community noted that their sugarcane has been overstaying in the farm as the existing sugar factory ignores

their area due to poor feeder roads. They requested the proponent to have a docket for CSR and for this purpose. The proponent representative agreed and responded that CSR shall form part of the company policy to help the community.

(j) Other Benefits to the community

Community requested that trainings and other benefits to flow to the locals. The proponent representative replied that other crops such as coffee and Avocado would be integrated in the project to help the farmer maximize on the land use and total profit.
On the third year of factory operation, the management will start introduce a program to help the farmer access the milk and beef market easily. This will be done by constructing a demo-shed of 50 cows' capacity to teach the farmers. The project is targeted to help more than 200 workers and from among the registered farmers. CSR activities have widely been incorporated in the project i.e Dispensary, Road's construction, schools among others.

(k) Issue of salty soil and issuance of seeds to farmers

Residents requested the proponents to ensure that the soil was tested and assure them of the seeds. They also wanted to know if the farmers will be given seeds and fertilizers. They attributed this as an excuse by current existing miller to avoid collecting sugarcane from far especially their area which had poor road. In reply, the proponent representative said that first, the issue of salty cane was not there as they had also sampled the soil in the area and has indicated that it was very suitable for the sugarcane growing and was indeed one of the best in the area.

(l) Company to give quality seeds

The community requested that they should be issued with cane seeds especially those that had farms and had not planted sugarcane. They also sought to know the quality of seeds.

They locals were urged by the proponents to plant even more and feed the proposed factory with the same. Proponents said they would give farmers fertilizer and quality seeds that matures even faster between 12-14 months.

5.6 Recommendations made by Key Stakeholders

First, a stakeholder's consultation meeting was organized at the area chief's office on **7th march 2023**. This provided the platform to brief local stakeholder's especially the area MCA, area chiefs and village managers of the proposed project.

The second and major key stakeholders' consultation meeting was convened at Mara Frontier hotel on **23rd march 2023**.

Figure 5.6: Ongoing Stakeholders Consultation at Olmismis and Narok town respectively

The following is a summary of key concerns that were raised by some stakeholders:

Table 10: summary of key concerns from some stakeholders

Department	Particulars	Designation	Comments/ Concerns
Agriculture, Livestock and Fisheries	Hon. Joyce T. Keshe Livingstone Chepukel	CECM. Chief Officer	Focus to alleviate food insecurity and poverty
Water Resources Authority	Joshua O. Osio	Sub regional manager	-The catchment falls within WRA Kisii office and therefore compliance documents will be obtained there. -Pollution prevention to protect the water nearby resources -Abstraction of water from the dam

			-Permits must first be obtained. He guided on the procedure.
Directorate of Occupational Safety and Health	Kelvin Purko	COSHO	-Ensure workplace Registration is done - Ensure the workplace is free of any hazards, and complies to laid down standards to assure safety of employees
Public Works, Roads & Transport (NCG)	Hon. John Gatua	CECM	Factory to work close with his department to ensure expansion of roads in the area
Ministry of Interior and Coordination of National Government	Samuel Seitai	Senior Chief	His office is ready to work together with the investors to ensure security and any arising grievances are resolved amicably.
National Environment Management Authority	Mr. Fanuel Mosago	CDE	Project to ensure all project impacts are successfully mitigated against. To put proper mechanisms in place to control pollution.
Health and Sanitation (NCG)	Hon. Anthony Namunkuk	CECM	Issues of waste and wastewater and other pollution management must be incorporated
Trade	Johnson Palmeris	Representing C.O	implication of project on trade
Narok County Assembly	Hon. Leina Morintat Hon. Duncan Bore	MCA for the Proposed project area MCA (Accompanied area MCA)	Representing the interests of the locals in the proposed project
Public Service Management & Labour	Hon. Josephine Chepngétich Ngeno	CECM	Labor issues affecting the locals

5.7 Conclusion from Public Participation and Stakeholders Consultation (PP&SC)

From the public participation and stakeholders' engagement exercise conducted and analysis of the questionnaires administered, it is obvious that the project is very welcome in Olomismis and Transmara West and the larger Narok County. The local community pointed how they will stand to gain from the project as most of their land is lying idle and it has high potential for cane production while those that had suffered from exploitation due to monopoly. The community unanimously welcomes and supports the project without any single objection. Key recommendations from stakeholders have been incorporated in this study report and mitigation measures and monitoring plan provided.

CHAPTER SIX:
ANALYSIS OF PROJECT ALTERNATIVES

6.1 The Proposed Alternatives

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

To be economically viable, the preselected sites must combine the following:

i) Abundant resources, available all year long and the possibility of sustainable production;
ii) Existing water supply all year long in acceptable quantity and quality;
iii) Existing transportation facilities or possibilities to create them at a reasonable cost; and
iv) Existing energy supply.

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 has 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, 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's 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 for implementation of 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 already initiated and paid for the land that he deems the most suitable for such a 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 the Proponent 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 available 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

The sugar factory will connect to Kenya Power for energy apart from using its own by-product bagasse as fuel and production of co-gen power. Alternatives like utilizing diesel for generator or solar power for manufacturing are too expensive. Solar power can be utilized for the housing estate for the provision of hot water and security purposes.

It is also recommended that the factory harvest rain water from the roofs both in the factory and the residential estates for sugar processing and domestic use respectively. Other technologies include Resource Recovery and Waste minimization.

6.4 Waste Management Alternatives

6.4.1 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 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 and therefore this option may not be ideal one if efficiency is to be achieved.

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, the contracted waste collectors are supposed to dispose the waste at a designated waste disposal site which is far therefore the number of trips needs to be minimized as much as possible.

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.

6.4.2 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 company has explored the possibilities of shifting the bagasse from the proposed 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. Reuse of bagasse in making of briquettes

Briquettes is another option that has been considered by the proponent once the mill commences operation. This will involve drying bagasse from 45% - 50% to the required 8% moisture content in order to make the briquettes.

c. Reuse of bagasse in making of briquettes

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

d. 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 utilize a fraction of the fresh bagasse daily out of the quantities produced from crushing of cane per day.

The power plant specified by the company, is Waste Exchange Oriented Unit (WEOU). The design recommended for this project will address environmental concerns related to projects of this nature as is illustrated in the figure 6.4.2 below:

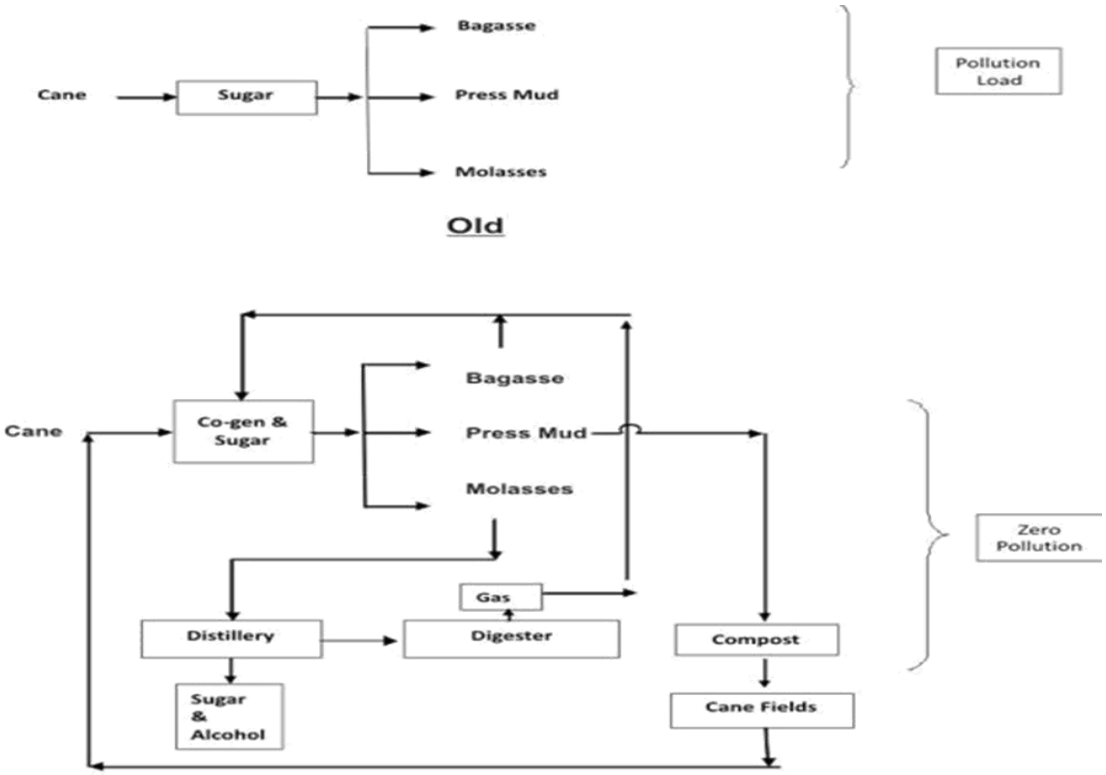

Figure 6.4.2: Illustration of the various waste management processes

6.4.3 Boiler Ash and Filter Mud Management

By-products, ash and filter mud will be used as composting materials and used as a **fertilizer on cane farms and gardens**. Boiler ash is washed from the mill chimneys and filter mud is the residue left after the sugar has been clarified. Press mud or filter 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 highly recommended for use mainly as fertilizer.

Other option considered will include selling the ash to brick manufacturers. These methods have been benchmarked in similar projects and considered as good options to overcome the problems associated with the industrial wastes.

6.4.4 Management of Molasses

Molasses will be stored in RCC tanks or steel tanks above ground level. Otherwise, there is a possibility of ground water contamination due to the high BOD of molasses that may cause pollution problems due to mishandling. All the molasses produced at the factory will be sold to existing distilleries for ethanol manufacture/alcohol production, agrochemicals and animal feed manufacturing companies.

6.4.5 Treatment Alternatives

The sugar industries effluent is characterized by oil and grease, BOD, COD, suspended solids and pH requiring treatment. Unlike distilleries, the BOD level is not high. The factory can consider to use the activated sludge process, extended aeration, aerobic lagoon, anaerobic treatment alone e.g. Up flow or anaerobic sludge blanket (UASB) or diphasic anaerobic reactor or UASB followed by aerobic lagoon for the treatment of factory effluents. Having an effluent treatment plant will help reduce the effluent The ETP will see the BOD reduced from between **1000-1200 ppm to 80 ppm**, COD reduced from between **3000-3500 ppm to 250 ppm** while TSS is expected to reduce from between **500-600 ppm to 150 ppm**. Though this system is very effective in the treatment of wastewaters, require large tracts of land and release serious odors.

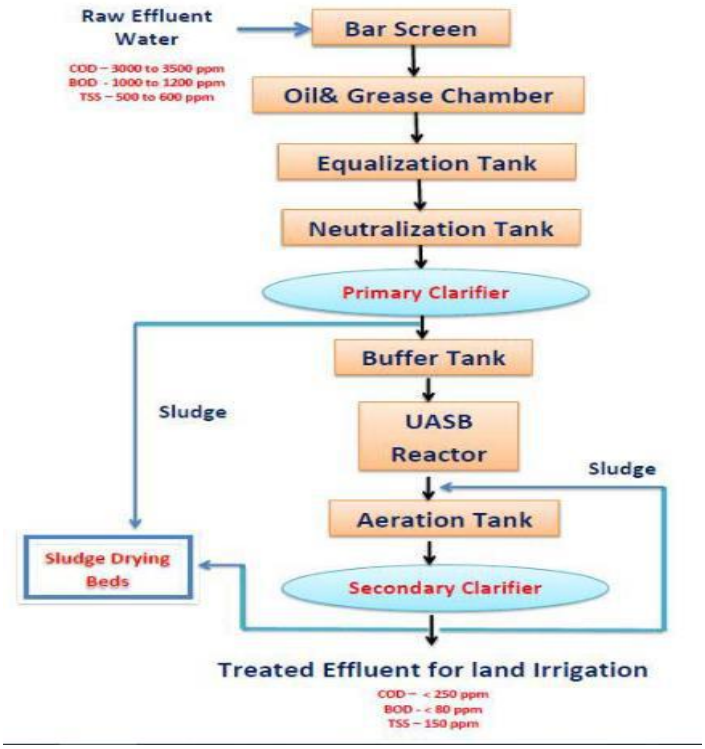

Figure 6.4.5: Typical ETP processes in a sugar plant

An alternative has been recommended for use by the directors of the proposed Soit Sugar Factory is to install a modern Effluent Treatment Plant with a final Reverse Osmosis that will produce high quality of treated wastewaters and avoids serious odors. Reverse Osmosis and Microfiltration technologies for treatment of industrial raw water are better, both in terms of quality and quantity of treated water, when compared to the more conventional lagoon technologies.

To avert large quantities of wastewater generated, wastewater can be reused as a reduction measure and can involve the following:

Washing Water: Wash water may contain sugar and therefore requires treatment and should not be recycled. Periodic cleaning results in high BOD and it also contain caustic soda and weak acids.

Testing Water: This water is safe for returning it to the service water tank.

Oil and Grease: Providing suitable oil and grease traps can eliminate this.

Chemical Reuse: The stored and settled supernatant can be reused with a little addition of fresh caustic soda for next cleaning operation. Molasses Handling: It is necessary to store molasses in RCC tanks or steel tanks above ground level. Otherwise, there is a possibility of

ground water contamination. The high BOD of molasses may cause pollution problems due to mishandling.

6.5 Most preferred Options

For this project, there are limited alternatives for the project site because the proponent already has vast land away from the neighbors residence and has already invested a lot in preparation for the proposed project at the site. Therefore, emphasis is placed on the technological approaches that the proponent will adopt in constructing and managing environment, health and safety of the proposed sugar factory development.

CHAPTER SEVEN
DESCRIPTION OF POTENTIAL ENVIRONMENTAL/SOCIAL-ECONOMIC IMPACTS AND MITIGATION MEASURES

7.1 Introduction

This Chapter identifies and discusses both positive and negative impacts associated with the construction and operation of the proposed sugar factory. On-site and off-site impacts can occur due to project location, and during construction, operation and decommissioning phases of the proposed Project. Identification and assessment of impacts depend on the nature and magnitude of the activity being undertaken and also on the type of pollution control measures that are envisaged as part of the Project proposal. The impacts are identified according to phases namely: Impacts during construction, operation and decommissioning phases.

7.2 Anticipated Positive Impacts and Enhancing Measures During Construction Phase

A number of positive impacts are associated with the proposed Sugar factory during construction phase. These will be positive impacts to the physical, social, economic and biological environment. The socio-economic benefits will be manifested to local communities by improving their living standards, the nation through improving the food security situation, the region and global community through export of agricultural produce or importing of farm inputs. However, it is upon all stakeholders to ensure the sustainability of the proposed project for long- term positive impacts to be realized. The following describes the positive impacts anticipated at construction phase;

7.2.1 Employment opportunities

The project will create direct employment to a number of people during construction and operation phase as skilled and non-skilled laborers. The living standards of a significant number of people will improve due to the availability of income from the construction of the project. Finally, during the construction phase, there will be a significant increase in the people working in the area and this will promote the economy of the county both directly and indirectly

7.2.1.1 Enhancement Measures

The local people need to be given first priority in employment opportunities particularly unskilled and skilled labour unless it cannot be found within the project area. The contractor should source materials locally from suppliers to employ more people. Project stakeholders

should also enforce the government policy of providing 30% of jobs or supplies of goods and services to Vulnerable and Marginalized groups within the project area

7.2.2 Increased income

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 increasing their income.

7.2.2.1 Enhancement Measures

The contractor will be encouraged to source locally available materials as much as possible. This provides ready market for building material suppliers such as quarrying companies, hardware shops and individuals with such materials from among the community members.

7.2.3 Encouraging Business Opportunities

The construction work will attract other business opportunities for example 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. The influx of population will also require accommodation in the vicinity and encourage more housing in the area.

7.2.3.1 Enhancement Measures

For the income to be of significance to the local population, deliberate moves should be taken including; contracting a local food vendor to supply food to construction workers. The proponent should encourage the community to start building residential houses for new workers within the neighborhood.

7.2.4 Industrial development in Narok County

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.

7.2.4.1 Enhancement Measures

The county government should encourage more development projects like the proposed sugar project. The proponent to liaise with relevant line ministries in expanding the area amenities are. This will encourage more development in the area and attract new investors in other sectors.

7.3 Anticipated Negative Impacts and Mitigation Measures During Construction Phase

The proposed development will equally have some negative environmental and social impacts. The impacts will emanate from physical construction of the whole project components. There is need therefore to identify the adverse impacts and mitigation measures to improve environmental and social sustainability of the project before implementation stage.

7.3.1 Loss of Vegetation

Clearance of vegetation will be experienced during excavation to develop the site, access roads and other infrastructure. Also, it will bring up more land under cultivation. Reliance on wood fuel and charcoal by the local people on the other hand will create more pressure on the existing vegetation a result of the factory construction. The project site is under sugarcane plantation. Some vegetation will however 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

- The vegetation loss is set to be confined to the project location. The contractor will ensure 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.
- Locate project components where there are less vegetation to minimize vegetation disturbance

7.3.2 Local increase of construction traffic

The construction of the proposed Project will make local increase of construction traffic inevitable. This is as a result of the movement of the construction vehicles and machines in and out of the construction site. However, there is unlikely to be significant increased traffic jam

along the road as a result of the construction vehicles maneuverings to the proposed Project site.

Mitigation

- ✓ The proponent through the contractor will put measures in place to mitigate the local traffic jam that will occur in the project are as a result of the construction vehicles turning to offload the raw materials to the site and after offloading the raw materials.
- ✓ To minimize the local construction traffic, construction vehicles will enter and leave the site at appropriate times.
- ✓ The contractor will also use signs and barriers to direct vehicles and pedestrian traffic as needed around the construction site.
- ✓ Some activities may also be scheduled in off-peak traffic times to minimize impacts.

7.3.3 Noise pollution and vibration

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

- ✓ Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.
- ✓ 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;
- ✓ Prescribe noise reduction measures if appropriate e.g. restricted working hours, transport hours and noise buffering Use quiet equipment (i.e. equipment designed with noise control elements).
- ✓ The contractor will ensure that NEMA noise and Vibration standards are observed
- ✓ Construct mainly during the day. The time that most of the neighbors are out working.

7.3.4 Impact on air quality

Potential impacts on the air quality during construction phase will be due to exhaust and dust emissions generated in and around the construction site by the construction equipment. Motor vehicles used to mobilize materials for construction and operating of construction vehicles and equipment would cause a potentially significant air quality impact by emitting pollutants through exhaust emissions.

The sources of air emission can be grouped into three categories namely:

- Point Source;
- Area Source; and
- Line Source.

A point source is a single source of emission with an identified location; an area source is when the sources of emission are many widely distributed point sources having relatively comparable significance; and a line source is when the sources of emission from a number of fixed or moving facilities have relatively comparable significance, such as roads.

Air emissions result from construction activities such as excavation, earthmoving and land filling, stone cutting and concrete processing as well as the loading and unloading of construction material and waste. Impacts include increased dust and airborne particulates caused by grading, filling, removals and other construction activities. After construction is complete, dust levels are expected to return to near non-existing conditions. Air quality impacts may also result from emissions from construction equipment and possibly from traffic stopped at the entrance of the building site to deliver materials.

During the period of maximum construction activity, the fuel consumption at the Project site is expected to rise significantly and the background concentrations of Suspended Particulate Matter (SPM), Respiratory Particulate Matter (RPM), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2) and both Carbon Monoxide (CO) and Lead (pb) are also expected to rise.

These emissions can have significant cardio-pulmonary and respiratory effects on the local population; the health effects may range from subtle biochemical and physiological changes to difficulty in breathing, wheezing, coughing and aggravation of existing respiratory and cardiac condition. The impact of such emissions can be greater in areas where the materials are sourced and at construction site. Activities associated with site clearance, excavations,

spreading of the top soil during construction, frequent vehicle turning and slow vehicle movement loading and off- loading areas can be implicated in this process.

Table 11: Summary of impacts of emissions on human health

Pollutant	Source	Primary effects
Sulphur Dioxide (SO_2)	Combustion of sulphur containing fossil fuels for: ▪ Construction equipment ▪ Vehicle ▪ Diesel engine	▪ Plant injury ▪ Reduced visibility ▪ deterioration of metals, textiles, leather, finishes and coatings ▪ aggravation of respiratory diseases (asthma, emphysema) ▪ irritation
Nitrogen Oxides (NO_X)	Combustion of fossil fuel from: ▪ Construction equipment ▪ Vehicles ▪ Diesel generators	▪ Aggravation of respiratory illness ▪ Reduced visibility ▪ Reduced plant growth ▪ Formation of acid rain
SPM (Dust)	▪ Construction activities ▪ Combustion of fossil fuels for construction equipment, vehicle and diesel generators.	▪ Soiling ▪ Reduced visibility ▪ Aggravation of the effects of gaseous pollutants ▪ Increased cough and chest discomfort ▪ Reduced lung function ▪ Aggravation of respiratory and cardio-respiratory diseases
Carbon Monoxide (CO)	Combustion of fossil fuels from ▪ Construction equipment ▪ Vehicles ▪ Diesel Generators	▪ Plant injury ▪ Reduced visibility ▪ Deterioration of metals, Textiles, Leather, finishes, coatings ▪ Irritation of eyes

		▪ aggravation of respiratory diseases (asthma, emphysema)

Air quality impacts generated from exhaust emissions and dust emissions will be minimized as follows.

Mitigating Exhaust Emission

The following measures shall be implemented during construction to minimize the exhaust emission:

- The engine size of the construction equipment shall be the minimum practical size;
- The number of construction equipment operating simultaneously shall be minimized through efficient management practices;
- Vehicle idling time shall be minimized; and
- Equipment shall be properly tuned and maintained as per the manufacturer's specifications.

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

Mitigating Dust Emission

Dust emissions from construction sites can also pose health risk to workers, and sensitive receptors surrounding the site, if not managed properly. It is the responsibility of the contractor to provide appropriate safety training, information equipment, signage, security and emergency response plans on site.

To mitigate the impact of SPM (dust), the following measures are recommended for implementation:

- 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;
- Watering all roads used for any vehicular traffic at least twice per day of active operations or road used for any vehicular traffic once daily and restrict vehicle speed to 15 mph;
- The soil surface shall be kept humid through water spraying to control the level of dust during excavation works.

- Provide dust masks to construction staff working in dusty areas
- Construction materials must be properly stacked
- Dispose of debris from the construction site by licensed waste trucks to authorized dumping sites
- Down wash of trucks (especially tyres) prior to departure from site;
- Cover stockpiles of sand, soil and similar materials or surround them with wind breaks;
- Cover trucks hauling dirt and debris to reduce spillage on to paved roads surface or have adequate free board to prevent spillage;
- Trucks carrying construction waste shall be covered during their trip from the construction site to the final disposal location.
- Post signs that limit vehicle speeds onto unpaved roads and over disturbed soils; and
- Rapid onsite construction so as to reduce duration of traffic interference and therefore reduce emissions from traffic delays.

7.3.5 Disposal of solid waste

Construction activities create solid wastes that need to be disposed. Such wastes include: Timber, metals, nails, wires, glass, plastic piping, excavated soil and rocks, packaging materials and containers e.g. paint pails, cement bags, metallic straps, etc.

Soils will be excavated at the proposed Project site; the excavation works to level the site and to come up with the foundation will result in the generation of the excavated material.

These wastes may have a direct impact on the neighboring premises. Disposal of the same solid wastes off-site could also be a social inconvenience if done in wrong places. The offsite effects could be un-aesthetics view, pest breeding, unhygienic conditions, chocking of nearby drains and stream and pollution of physical environment. Proper waste management will however be taken into consideration and proper dumping done according to the requirements and directions of NEMA.

If not properly disposed, these wastes will result in the pollution of soil, ground water and air (paint). Materials consisting of chemicals e.g. paints, cement and thinners will alter the chemical composition of these regimes.

Mitigation Measures

i) During the construction period an area will be specifically designated for solid wastes. These will be segregated and categorized into re-usable, those for re-sale and those that cannot be used again. Reusable material will be recovered so as to reduce wastage and cost of raw materials.

ii) The waste designated area will be well protected from the elements to ensure reduced chances of them being carried away by wind or rain.

iii) Surplus material that cannot be reused in any way will be removed from site by licensed waste handlers.

7.3.6 Increased water demand

During the construction phase, the construction works will create additional demand for water in the area especially Olchoroh lentim dam, in addition to the existing demand at the project area. Water will mostly be used in the following activities:

- Concrete works including curing;
- Controlling dust on site;
- Washing of machinery and equipment;
- Preparing of mixtures, including water-based emulsion paints;
- Washing and drinking by construction workers;
- General cleaning; and
- Landscaping.

Increased water demand could result in increased Project costs, increased health risks, and increased soil erosion if not properly managed.

Mitigation

- ❖ Drilling a borehole
- ❖ Prompt reuse and recycling of water as much as possible where necessary
- ❖ Install a discharge meter at water outlet to monitor and determine total water usage.
- ❖ Monitor water consumption and utilization;
- ❖ Sensitize construction workers on the importance of proper water management;
- ❖ All wastewater should be drained into approved drainage facilities.
- ❖ Promote awareness on water conservation and reducing water wastage;
- ❖ Quick fixing of licking pipes

- ❖ Rain water harvesting should be taken into consideration to capture rain water and store.

7.3.7 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

- ✓ Sensitization of 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
- ✓ Complementary to these measures, the Contractor shall monitor energy use during construction and set targets for reduction of energy use
- ✓ The Contractor will also develop energy management plan.
- ✓ Construction machinery and vehicles should be maintained and used in accordance with manufacturer's specifications, to maximize efficiency and lower use of energy, e.g. drivers of construction vehicles should be instructed not to leave them idling for extended periods;

7.3.8 Increased storm water runoff from new impervious areas

Construction of the proposed Project and access driveway could result in additional runoff through creation of impervious areas. These areas generally have higher runoff coefficients than natural area, and increased flood peaks are a common occurrence in developed areas.

The storm water runoff is likely to increase the flooding along access roads.

Mitigation

- ✓ Leveling the Project site to reduce run-off velocity and increase infiltration of rain water into the soil.

- ✓ A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structures will be designed.

7.3.9 Extraction sites and impacts of use of building materials and procurement

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. This will have impacts including clearance of vegetation, destruction of landscape, dust and general disturbance during excavation. There is 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. When left unfenced, quarries and borrow pits pose a risk to public especially children; livestock and wildlife due to drowning associated deaths, therefore should be fenced off when in use.

Mitigation

- ✓ The Proponent of the proposed Project shall ensure that all 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. Since such firms are expected to apply acceptable environmental performance standards, the negative impacts of their activities at the extraction sites are presumably well mitigated.
- ✓ To reduce the negative impacts on availability and sustainability of the materials, the Proponent will only order for what will be required through accurate budgeting and estimation of actual construction requirements. This will ensure that materials are not extracted or purchased in excessive quantities.
- ✓ Moreover, the Proponent will ensure that wastage, damage or loss (through run-off, wind, etc) of materials at the construction site is kept minimal, as these would lead to additional demand for and extraction or purchase materials.
- ✓ In addition to the above measures, the Proponent shall consider reuse of building materials and use of recycled building materials. This will lead to reduction in the quantity of raw materials extracted from natural resources as well as reducing impacts at the extraction sites.

The following should also be taken into consideration:

- 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.

7.3.10 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. 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. 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

- ✓ The Contractor shall control dangers of oil and fuel spills during construction by maintaining machinery in specific areas designated for this purpose.
- ✓ Ensure proper oil/fuel management as earlier on stated
- ✓ Ensure good waste management practice to prevent occurrence of leachate

- ✓ Prompt cleaning of oil and fuel spills, and proper disposal of clothing or rags contaminated with oil will also take place.

7.3.11 Risk of Water pollution.

Water pollution both for surface and ground water may be compromised due to the development in the area. 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

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.

Mitigation

- ✓ 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 contractor’s camp are adhered to as per the provisions of NEMA water quality regulation as shown in the baseline section on water quality.

7.3.12 Loss of aesthetic value

The project site has nice scenery in terms of vegetation and landscape. Clearance of vegetation, extraction of materials 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
- ✓ Minimize on the excavations and ground disturbance

7.3.13 Occupational Health and Safety

During construction, project 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 among others. 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.
- ✓ 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.
- ✓ Building materials will be inspected according to the occupational health and safety standards.
- ✓ 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

7.3.14 Labour influx and associated effects of population increase

This impact is triggered during Project Construction Phase due to the Project attracting various categories of workers from local and national or even international markets. This therefore can lead to new people coming to Kilgoris town area drawn from diverse social and cultural backgrounds often resulting to a number of issues as listed below;

(i) Strain on various resources especially water resources
(ii) Grievances from local community members over job opportunities
(iii) Sexual Exploitation and Abuse
(iv) Unwanted Pregnancies

Mitigation Measures

i) 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;

ii) Requirements by the facility will be made in an organized manner from the surrounding communities; thereby reducing occurrence of opportunistic hawking that could result in a myriad of vices such as drug use and peddling, petty crime, alcohol abuse and harboring of criminals.

iii) During construction phase close monitoring of workers will be undertaken to ensure that unwanted characters are not absorbed.

iv) In addition, activities will be undertaken in a closed environment and food and other requirements will be provided within to reduce traffic in and out of the building site.

v) Security will be enhanced in and around the project site to reduce cases of material theft and any other uncalled-for occurrences.

vi) Security agencies will be requested to beef up the current small police post in the area.

7.3.15 Sexual Exploitation and Abuse (SEA)

This impact refers to sexual exploitation and abuse committed by Project staff such as contractor or his employees against communities and represents a risk at all stages of the Project, especially when employees and community members are not clear about prohibitions against SEA in the Project.

Mitigation

- Management and Coordination: including integration of SEA in job descriptions, employments contracts, performance appraisal systems, etc.; development of contract policies related to SEA, including whistle blower protection and investigation and disciplinary procedures; training for all project management; management of coordination mechanism for case oversight, investigations and disciplinary procedures; supervision of dedicated PSEA focal points in the project and trained community liaison officers.
- Engagement with the community: including development of confidential community-based complaints mechanisms discrete from the standard GRM; mainstreaming of SEA awareness-raising in all community engagement activities; community-level IEC materials; regular community outreach to women and girls about social risks and their SEA-related rights;

7.3.16 Human Health Impact-Increase in incidences of HIV/AIDS and STIs

The project will attract new people to the project area and this can lead to several repercussions such as the spread of HIV virus. Influx of new people to the project area especially construction workers can affect the number of new cases of HIV & AID, because they often interfere with an otherwise stable situation but the contrary can also happen where the newcomers find themselves at higher risk.

Mitigation

There is always a concern of moral decay in the society that would arise from sexual relationships between residents and new workers leading to cases of increased transmission of HIV/AIDs and STDs. These will be achieved through

- Sensitization of the workers to adhere to work ethics and awareness creation at the community level on safe sex.
- Collaborating with other entities to put up a VCT centers near Soit Sugar Factory

7.3.17 Gender Based violence and Sexual Harassment

This impact is triggered during Project Construction Phase when the Contractor fails to comply with the following provisions.

(i) Gender inclusivity requirements in hiring of workers and entire Project Management as required by Gender Policy 2011 and 2/3 gender rule.

(ii) Failure to protect human risk areas associated with, Disadvantaged groups, interfering with Participation Rights, and interfering with Labour Rights.

Mitigation

- Ensure clear human resources policy against sexual harassment that is aligned with national law.
- Integrate provisions related to sexual harassment in the employee code of conduct.
- Ensure appointment of human resources personnel to manage reports of sexual harassment according to policy
- The proponent to ensure that gender-based violence at the workplace is not triggered by the Project, including:
    a) Effective and on-going engagement and consultation with female workers, particularly with women and also girls at the community.
    b) Review of specific project components that are known to heighten GBV risk at the community level, e.g. compensation schemes; employment schemes for women; etc.

7.4 Operation Phase Impacts

(a) Positive Impacts

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

7.4.1 Employment opportunities

Employment creation is one of the major impacts of the proposed Project during its operational phase. Technicians and operators will be employed in the project. Those contracted or employed will generate income as a result of being employed or contracted.

7.4.2 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.

7.4.3 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.

7.4.4 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 in that the proposed Project will provide extension services, construct roads, a health center, water points and support the needy in the society as part of their CSR.

7.4.5 Increased market for sugar and related by-products

The farmers and the general consumer community are likely to benefit from the operation of the sugar factory since wholesalers who will purchase sugar and by-products products from the factory premises will improve their sales.

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

7.4.6 Improvement in the livelihoods of the sugar farmers

Farmers in Olmismis anticipate they will gain from prompt payment of sugarcane produce as a result of introduction of the sugar factory in their area. 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.

7.4.7 Increased Participation of Women in Socio-economic Development

The prevailing socio-cultural norms influencing household division of labor will determine women income over the normal routines such as; looking after children, preparation of food and collecting water and firewood which are tasks for the women. By constructing of the sugar

factory closer to the communities, the women will be able to spend their time in other productive activities thereby increasing their participation in socio- economic development. It is also expected that same will improve the economic and social status of women.

7.4.8 Boosting Industrial Development in the area

The proposed sugar factory project will not only enhance the economy but also contribute to industrial development in line with Vision 2030 economic development agenda of refurbishing and expanding the manufacturing industries in Kenya.

7.4.9 Reduced loss to farmers and Prompt Cane Harvesting

Due to the distance travelled to the milling factories, farmers were experiencing delays in harvesting their cane forcing cane overgrowing and overstaying on the farms. 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.

7.5 Negative impacts and Mitigation Measures During Operation Phase

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

7.5.1 Increased water use

The industrial activities during the operation phase of the Project will involve use of large quantity of water. This will increase the water demand in project area and increase pressure due to excess abstraction of water from existing dam.

Mitigation

- ✓ Immediately drill boreholes and additional dam as proposed
- ✓ Install water conserving taps;
- ✓ Promote recycling and reuse of water as much as possible;
- ✓ Promptly detect and repair of water pipes and tank leaks; and
- ✓ Install discharge meter to determine and monitor total water usage.
- ✓ Re-use the water for cooling purposes;
- ✓ Use closed loops for intensive solid generating washings, (e.g. cane and beet wash) and flue gas scrubbers.
- ✓ 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.

7.5.2 Disposal of waste water/ Wastewater management

Since the disposal of waste water will be directed to the effluent treatment plant, if the plant is not efficient enough it may require alternative treatment, which may be costly. However, since the factory will utilize the effluent treatment plant as proposed, it is anticipated that the plant will work efficiently. The sources of wastewater in the factory will result from the following:

Mill house: Due to 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. A 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 number 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 minimize content of pollutants in the waste water

(i) Management Sanitary Wastewater

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.

(ii) Water quality 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.

Mitigation

- Carry out regular inspection and maintenance of the ETP to ensure zero leaks and damages
- Install a water meter to measure the amount of waste water released from the factory on a daily basis
- Carry out an analysis of the composition of the effluent through a NEMA registered laboratory. Analysis should be conducted by entities permitted or certified/accredited for this purpose. Comply with EMC (Water quality) Regulations 2006 by:
    - Having appropriate liquid waste treatment facility,
    - Ensuring that the effluent discharged meet the set standards. Continuously monitor the discharge as per the regulations
    - Apply for an effluent discharge license from NEMA on annual basis
- Have a department / section handling water quality monitoring
- There shall be personnel designated / employed to man and operate the waste management system. Sampling shall be conducted by or under the supervision of trained individuals
- Designate Effluent sampling point at strategic upstream points and discharge point.

7.5.3 Increased storm water flow

Upon completion, the building roofs and pavements of the project will lead to increased volume and velocity of storm water or run-off flowing across the area covered by the proposed Project. Rapid runoff causes erosion.

Storm water runoff contains suspended sediments, metals, petroleum hydrocarbons, coliform, which carried downstream hence resulting to degrading the quality of the receiving water.

Mitigation Measures:

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

- Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas.
- Good housekeeping to avoid contamination of storm water;
- Provision of slit traps in storm water drains
- Regular inspection and cleaning of storm drains.
- 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;
- 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.

7.5.4 Air Pollution

Potential sources of air emissions in sugar manufacturing are primarily related to particulate matter generated from:

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

The bagasse, on burning, produces particulates, viz., unburnt fibres, carbon particles and gaseous pollutants like oxides of nitrogen, water vapour and other organic compounds. Of the particulate waste, the heavier particles slowly settle down in the surrounding area. Such dust fall leads to the problems of cleaning, reduction in property value, effect on vegetation, etc. The main gaseous pollutants are CO, which is altogether not measured by any unit, and CO2 is reported to be in the range of 12 – 14%.

Motor vehicles used to mobilize materials and equipment would cause a potentially significant air quality impact by emitting pollutants through exhaust emissions.

During the period of operation, the fuel consumption at the Project site is expected to rise significantly and the background concentrations of Suspended Particulate Matter (SPM), Respiratory Particulate Matter (RPM), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2) and both Carbon Monoxide (CO) and Lead (pb) are also expected to rise.

These emissions can have significant cardio-pulmonary and respiratory effects on the workers; the health effects may range from subtle biochemical and physiological changes to difficulty in breathing, wheezing, coughing and aggravation of existing respiratory and cardiac condition.

Air emission specifications should be considered during all equipment selection and procurement.

Mitigating Exhaust Emission

- 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.

Mitigating Stack Emissions

- 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;
- Regularly monitor stack emission. Explore the use of modern technology systems such as bio-filters and chemical scrubbers to control Ensure timely renewal of the air emission license from NEMA.

- Exhaust gas recirculation
- Selective non-catalystic/catalystic reduction
- Installation of wet scrubbers and thermal oxidizers. Use acceptable emission control technologies as per the Seventh Schedule of the Environmental Management and Coordination (Air Quality) Regulations, 2014. The technology to mitigate particulate matter will be mechanical collectors (dust cyclones, multicyclones) and particulate scrubbers, sulphur oxide will be wet scrubbers and nitrogen oxide will be NOx scrubbers.
- Avoid overloading the bagasse for efficient burning
- Use the correct fuel to air ratio by proper adjustment of air and fuel ratios
- Avoid carbon build-up in the boiler and furnace tubes and maintain the boiler and furnace settings in good condition

Mitigating Fugitive Dust Emission

- 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.
- Watering all roads used for any vehicular traffic at least twice per day of active operations or road used for any vehicular traffic once daily and restrict vehicle speed to 15 mph inside the compound;
- Post signs that limit vehicle speeds onto unpaved roads and over disturbed soils

Mitigating Dust Generated during Bagasse Handling, Storage and Disposal

Bagasse may create nuisance of dust contributing to pollution of the environment. The proponent proposes to use bagasse in the Co-gen power plant to generate power for use in the sugar mill. Mitigation measures includes:

- Ensure an enclosed bagasse shed to keep the dust enclosed.
- 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.
- Procure and install adequate dust screens around the bagasse storage area
- Immediately repair leakages in bagasse and bagacillo chutes to reduce dust releases.
- Provide Personal Protective Equipment and training to personnel working directly with bagasse.

- Plant fast growing trees such as casuarina along the boundary wall to act as dust screens and a buffer zone between the facility and the neighbors
- Develop and implement an air quality monitoring plan to ensure compliance with the limits set under the Third Schedule of the Environmental Management and Coordination (Air Quality) Regulations, 2014
- Comply with the provisions of the Environmental Management and Coordination (Air Quality) Regulations, 2014.

7.5.5 Generation of solid waste

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

- Bagasse
- Press mud
- Paints, lubricants and petroleum wastes;
- Packaging materials;
- Metal, glass, plastic containers and other unwanted materials; and
- Food remains.

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

Management option for 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. Excess can be converted into fertilizer upon mixing with press mud. It is also a raw material for production of briquette, paper, boards, animal feeds and ethanol.

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 minimize its amount, the company can sell it out to those reusing it for briquette making and other re-users/ recyclers.
- Bagasse could be a suitable soil conditioner if applied in thin layers and with pH adjustment.

Press Mud: It 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.

Mitigation

- Set out a mechanism for collection and giving to the farmers for use as fertilizer

- Proper waste management will however be taken into consideration and proper dumping done according to the requirements and directions of NEMA.

7.5.6 Energy consumption

The proposed Project will consume fossil fuels to run and heat the machinery, lighting and 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. Efficient management of energy consumption is therefore required for optimal performance of the Project and to control Project costs.

Mitigation

- Maximize the contribution of daylight to reduce use of artificial lighting in the buildings;
- Select the most efficient lighting system design and minimum lighting level appropriate for the required application;
- Install energy saving appliances;
- Select the most effective lighting controls for optimal operating efficiency and minimum energy wastage.
- Develop an energy management plan.
- Proponent will procure plant machinery and equipment that feature the latest technology to ensure power efficiency
- Supplement electrical supply from the national grid with renewable energy such as solar to power the lighting system in areas such as offices and walkways
- Install compact fluorescent lights in high use areas within the facility
- Create awareness among employees and visitors on energy conservation such as switching off lights when not in use
- Carry out energy audits.

7.5.7 Oil and fuel spills

The machinery to be used in the plant 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, combustion processes would require fuels, which may lead to fuel spills. Irrespective of these possibilities, no significant adverse effects

are expected as a result of fuel and oil spills given the scope, nature and duration of time to be taken on the operation of the proposed Project.

Mitigation

- Provide oil spill response kit to aid speedy clean-up in case of spillage
- Train workers on containment and cleaning of oil spills
- Comply with the Used Oil Guidelines, 2017

7.5.8 Occupational health and safety risks

Workers are likely to encounter various occupational risks ranging from physical to biological and chemical hazards at the plant. 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, Exposure to dust and biological hazards, Exposure to chemicals (including gases and vapors), Exposure to heat and cold and radiation, Exposure to noise and vibrations.

Mitigation

- Ensure timely renewal of the certificate of registration of a workplace
- Provide adequate and appropriate Personal Protective Equipment (PPEs) to workers and enforce on their use
- Put in place an effective emergency response plan
- Ensure the floor is kept clean and dry always to avoid accidental falls or slips
- Display signage warning of potential hazards at various sections of the plant
- Conduct first aid training among the workers and provide well-stocked first aid kits at different sections in the facility
- Provide and keep an accident/ incident register
- Obtain insurance cover for the workers as per Work Injury Benefits Act (WIBA)
- Comply with the provisions of the Occupational Safety and Health Act, 2007

Managing Exposure to Bagasse dust at Workplace

Exposure to bagasse dust is a potential concern in the bagasse handling area of sugar mills. Recommended measures to prevent, minimize, and control dust include:

i. Enclose and ventilate saws, shredders, dusters, and bagasse conveyors;

ii. Consider enclosed chip storage;

iii. Avoid use of compressed air to clear dust and waste paper;

iv. Enclose and ventilate areas where dry, dusty additives are unloaded, weighed, and mixed, or use additives in liquid form;

v. Regularly inspect and clean dusty areas to minimize dust explosion risk.

Managing accidents due to 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.

Serious injury or fatality can result from inadequate preparation to enter a confined space or in attempting a rescue from a confined space.

Mitigation

- Engineering measures should be implemented to eliminate, to the degree feasible, the existence and adverse character of confined spaces.
- Permit-required 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

7.5.9 Accidents, injuries and falls

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 and operation equipment cuts from sharp edges of metal sheets among others.

Mitigation

- Display signage warning of potential hazards at various sections of the plant
- Provide adequate and appropriate Personal Protective Equipment (PPEs) to workers and enforce on their use.
- Put in place an effective emergency response plan
- Obtain insurance cover for the workers as per Work Injury Benefits Act (WIBA), 2007
- Comply with the provisions of the Occupational Safety and Health Act, 2007

7.5.10 Increased Traffic

An increase in the number of vehicles within the area is anticipated which may lead to congestion and pose a threat to accidental occurrences.

Mitigation

- There shall be dedicated attendant employed to direct vehicles during peak periods.
- 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.

7.5.11 Noise pollution and vibration

Noise pollution and vibration is likely to occur due to leveling and casting process at the proposed site. Since the proposed Project site is within already constructed commercial and industrial premises, the proposed Project construction will be a potential source of disturbance to the neighbors both week days and weekends. However, since there are noise abatement measures, adverse impacts to the workers and neighboring premises will be controlled.

Mitigation

- Procure and provide adequate earmuffs to employees working at peak noise producing areas and enforce on their use
- Reduce the working hours for employees working at peak noise producing areas compared to those working in other areas
- Use equipment that are properly fitted with noise reduction devices such as mufflers
- Service mechanical equipment regularly to ensure that they are in good condition
- Apply for and obtain license to emit noise/vibrations in excess of permissible levels as per the Fourth Schedule of Noise Regulations, 2009
- Comply with the provisions of the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

7.5.12 Fire Risks and Emergencies

Potential sources include flammable materials, combustion of bagasse in the boiler, juice treatment, clarification process and sugar boiling which is carried out at high temperatures, oil spills, electrical faults or operational negligence among others. Fire occurrence may lead to death, financial losses and loss of livelihoods for the workers and neighbors.

Mitigation

- Develop, clearly display and implement a fire and emergency evacuation procedure

- Procure and provide adequate firefighting equipment such as fire extinguishers, fire hose reels, smoke detectors, fire alarms and fire hydrants and place them strategically within the facility
- Ensure firefighting equipment are serviced regularly by accredited fire service providers
- Train employees on the use of fire-fighting equipment
- Designate a fire assembly point and clearly display emergency exit points at strategic areas within the facility
- Display fire safety and warning signage at appropriate sections of the plant
- Ensure proper handling and storage of flammable materials
- Plant operations should be undertaken by authorized personnel only
- Ensure regular inspection and maintenance of electrical appliances
- Conduct annual fire safety audit and fire drills
- Access to the plant should be controlled to limit exposure to hazards
- Comply with the provisions of the Occupational Safety and Health Act, 2007

7.5.13 Ergonomic effects

The relationship between the working posture and the machinery would affect the workers muscles and joints.

Mitigation

- The machinery should be designed to minimize adverse effects of poor working posture among the workers in the plant.

7.5.14 Vector and rodents breeding grounds – Vulnerability to diseases

If the project does not have well-designed storm water drains, the rainwater may end up stagnating or intruding neighbouring facilities and hence creating conducive breeding areas for mosquitoes and other water-based vectors leading to human diseases like malaria. Poor solid waste management practices may also lead to breeding grounds for pests such as rats and other scavenging animals.

Mitigation

The design of the construction should ensure that no space for stagnant water will be retained.

- The proponent should put in place efficient storm water and waste management systems that will prevent the accumulation of rain water and uncontrolled waste, as well as an efficient collection system and off-site disposal.
- A well-maintained trash collection point should be set aside.
- Proper monitoring of the premise should be effected for maintenance of health and hygiene.

7.5.15 Gender Based violence, Sexual Exploitation and Sexual Harassment

This impact is triggered during Project when the proponent fails to comply with the following provisions.

(iii)Gender inclusivity requirements in hiring of workers and entire Project Management as required by Gender Policy 2011 and 2/3 gender rule.

(iv)Failure to protect human risk areas associated with, Disadvantaged groups, interfering with Participation Rights, and interfering with Labour Rights.

Mitigation

- Integrate provisions related to sexual harassment in the employee code of conduct.
- Ensure appointment of human resources personnel to manage reports of sexual harassment according to policy
- The proponent to ensure that gender-based violence at the workplace is not triggered by the Project, including:
- Effective and on-going engagement and consultation with female workers, particularly with women and also girls at the community.
- Review of specific project components that are known to heighten GBV risk at the community level, e.g. compensation schemes; employment schemes for women; etc.
- Management and Coordination: including integration of SEA in job descriptions, employments contracts, performance appraisal systems, etc.; development of contract policies related to SEA, including whistle blower protection and investigation and disciplinary procedures; training for all project management; management of coordination mechanism for case oversight, investigations and disciplinary procedures; supervision of dedicated PSEA focal points in the project and trained community liaison officers.
- Engagement with the community: including development of confidential community-based complaints mechanisms discrete from the standard GRM; mainstreaming of SEA awareness-raising in all community engagement activities; community-level IEC

materials; regular community outreach to women and girls about social risks and their SEA-related rights;

7.5.16 Minimization of transmission of HIV/AIDs

There is always a concern of moral decay in the society that would arise from sexual relationships between residents and new workers leading to cases of increased transmission of HIV/AIDs and STDs. These will be achieved through

- Sensitization of the workers to adhere to work ethics and awareness creation at the community level on safe sex.
- Collaborating with other entities to put up a VCT centers near Soit Sugar Factory

7.5.17 Security of the Premises

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

i. 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;
ii. Procedures to leave items such as cigarettes, matchsticks, lighters, mobile phones, etc at the gate as a security measure to be put in place
iii. Well trained security officers from a reputable company to patrol the grounds
iv. The company should install an internal surveillance system that will monitor the plant at all times

7.6 Positive impacts during decommissioning phase

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

7.6.1 Rehabilitation

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

7.6.2 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.

7.7 Negative impacts during decommissioning phase

The following three negative impacts discussed below, are associated with the proposed Project during its decommissioning phase.

7.7.1 Noise and vibration

The demolition works will lead to significant deterioration of the acoustic environment within the Project site and the surrounding areas. This will be as a result of the noise and vibration that will be experienced as a result of demolishing the proposed Project.

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 be restricted to daytime;
- The project proponent will ensure that NEMA noise and Vibration standards are observed in all project activities presented in baseline conditions

7.7.2 Solid waste generation

Demolition of the proposed Project and related infrastructure will result in large quantities of solid waste. The waste will contain the materials used in construction including concrete, metal, drywall, wood, glass, paints, adhesives, sealants and fasteners. Although demolition waste is generally considered as less harmful to the environment since they are composed of inert materials, there is growing evidence that large quantities of such waste may lead to release of certain hazardous chemicals into the environment. In addition, even the generally non-toxic chemicals such as chloride, sodium, sulphate and ammonia which may be released as a result of leaching of demolition waste, are known to lead to degradation of groundwater quality.

Mitigation measures

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

7.7.3 Occupational health and safety impacts

During decommissioning phase, risks of accidents and ill health as a result of demolition activities are likely to take place. Demolition workers, neighboring premises are also likely to be affected by the dust generated and other fumes generated by the demolition machines.

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

7.7.4 Impact on air quality

Potential impacts on the air quality during decommissioning phase will be due to exhaust and dust emissions generated in and around the construction site by the construction equipment. Motor vehicles used to carry demolished materials would cause a potentially significant air quality impact by emitting pollutants through exhaust emissions.

Mitigation;

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

CHAPTER EIGHT
ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

8.1 Significance of an ESMP

As a requirement in the Environmental Management and Coordination Act (EMCA), 1999 the report should provide for a detailed ESMP. This Chapter therefore complies with the requirements of EMCA, 1999 and Environmental (Impact Assessment and Audit) Regulations, 2003 and takes into consideration the applicable local and international standards and best practices.

It should be noted that there is no universally accepted standard format for ESMPs. However, the format needs to fit the circumstances in which the ESMP is being developed and the requirements which it is designed to meet. The ESMPs should contain the following which are in line with the NEMA requirements:

- **Summary of impacts:** The predicted negative environmental and social impacts for which mitigation is required should be summarized;
- **Description of mitigation measures:** The ESMP identifies feasible and cost-effective mitigation measures to reduce significant negative environmental impacts to acceptable and legal levels;
- **Description of monitoring programme:** Environmental performance monitoring should be designed to ensure that mitigation measures are implemented. The monitoring programme should clearly indicate the linkages between impacts, indicators to be measured, measurement methods and definition of thresholds that will signal the need for corrective actions;
- **Institutional arrangements:** Responsibilities for mitigation and monitoring actions should be clearly defined;
- **Legal enforceability:** The key legal considerations with respect to ESMPs are:
  - Legal framework for environmental protection; and
  - Legal basis for mitigation.
- **Implementation schedule and reporting procedures:** The timing, frequency, and duration of mitigation measures should be specified; and

- **Cost estimates:** Costs should be calculated for both the initial investment and recurring expenses for implementing the mitigation measures.

The benefits of including the ESMP as part of the ESIA are:

- Encouraging applicants to be more systematic and explicit in the design and development of mitigation measures and the intended means of implementation;
- Encouraging authorities to check the practicality and likelihood of implementation of mitigation and monitoring measures;
- Ensuring that the mitigation measures are properly incorporated into the project design and contract documentation after authorization is granted;
- Encouraging the project proponent to meet the requirements of the ESMP which now form the basis for the conditions attached to authorization of the project; and
- Forcing the project proponent to internalize environmental impacts that would otherwise become a social cost.

The EMPs presented in this Chapter therefore summarizes the key impact elements identified and the remedial measures, the actions to be taken by various parties and the monitoring activities. An indication of the time scale for implementation and cost involved is also provided. The ESMP tables can be further expanded with documented procedures and guidelines for work practices so as to be as responsive to the situations that various contract parties will encounter. The parties should formulate procedures and practices and maintain records as required by EMCA.

The implementation of the ESMP should be done within the provisions of the law and for the ultimate benefit of the stakeholders in the Project area. The effectiveness of the ESMP shall be monitored and assessed during spot checks, formal inspections and at the end of the Project when an overall audit of the works shall be carried out.

8.2 Types of environmental and social management plans

There are three broad categories of ESMPs in the project lifecycle: The construction ESMP, the operation ESMP and the decommissioning ESMP.

The objectives of these ESMPs are all the same, namely to:

- Identify the possible environmental impacts of the proposed activity; and
- Develop measures to minimize, mitigate and manage these impacts.

The difference between these ESMPs is related to the difference in mitigation actions required for the

A construction environmental and social management plan is a practical and different stages of the project cycle.

8.2.1 Construction Environmental and Social Management Plan

Achievable plan of management to ensure that any environmental impact during construction phase is minimized. Construction environmental management plan provides specific environmental guidance for the implementation and construction phase of a project. It is intended to enable the management and mitigation of construction activities so that environmental impacts are avoided or reduced. These impacts range from those incurred during start up to construction activities. Table 12 below shows the construction environmental management plan for the Soit Sugar Factory.

Table 12: Environmental and Social management plan during construction phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (Ksh)
Minimize extraction site impacts and ensure efficient use of raw materials in construction					
Demand for raw material	• 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.	Contractor	Inspection	Throughout construction period	No added cost
	• Source building materials from local suppliers who use environmentally friendly processes in their operations.	Project Manager and Contractor	Inspection and Observation	Throughout construction period	No added cost
	• Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered.	Project Manager and Contractor	Inspection and Calculation	Throughout construction period	No added cost
	• Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.	Project Manager and Contractor	Observation	Throughout construction period	No added cost
	• Consider reuse of building materials and use of recycled building materials.	Proponent	Observation	Throughout construction period	No added cost
Minimization of construction traffic					

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (Ksh)
Minimization of local increase in construction traffic	• Construction vehicles should enter and leave the site at appropriate times.	Contractor	Observation and Inspection	Throughout construction period	No added cost
	• Using signs and barriers the Contractor will direct vehicles and pedestrian traffic as needed around the construction site.	Contractor	Observation and Inspection	Throughout construction period	100,000
	• Some activities may be scheduled in off-peak traffic times to minimize impacts.	Contractor	Inspection	Throughout construction period	-
Minimize solid waste generation and ensure efficient solid waste management during construction					
Increased solid waste generation	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction; 2. Recycling; 3. Reuse; and 4. Land filling.	Project Manager and Contractor	Observation	Throughout construction period	80,000
	• Order materials in the sizes and quantities they will be needed, rather than cutting them to size, or having large quantities of residual materials.	Project Manager and Contractor	Inspection and Observation	One-off	No added cost

	• Damaged or wasted construction materials to be recovered for refurbishing and used in other projects.	Project Manager and Contractor	Observation	One-off	No added cost
	• Use of durable, long-lasting materials to reduce the amount of construction waste generated over time.	Project Manager and Contractor	Inspection	Throughout construction period	No added cost
	• Provide facilities for proper handling and storage of construction materials.	Project Manager and Contractor	Inspection and Observation	One-off	50,000
	• Use building materials that have minimal or no packaging.	Project Manager and Contractor	Inspection and Observation	Throughout construction period	No added cost
	• Use construction materials containing recycled content where possible and in accordance with accepted standards.	Project Manager and Contractor	Inspection	Throughout construction period	No added cost
	• Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers.	Project Manager, and Contractor	Observation	Throughout construction period	No added cost
	• Dispose waste more responsibly by dumping at designated dumping sites or landfills only.	Project Manager, and Contractor	Inspection and Observation	Throughout construction period	20,000/month
	• Waste collection bins to be provided at designated points on site.	Project Manager, and Contractor	Observation	Throughout construction period	40,000

Minimize impacts on air quality					
Dust emission	• Downwash of trucks (especially tyres) prior to departure from site.	Contractor	Observation and Inspection	Throughout construction period	To be determined
	• Cover stockpiles of sand, soil and similar materials or surround them with wind breaks.	Contractor	Inspection and Observation	Throughout construction period	No added cost
	• Cover trucks hauling dirt and debris to reduce spillage on to paved roads surface or have adequate free board to prevent spillage.	Contractor	Inspection and Observation	Throughout construction period	No added cost
	• Post signs that limit vehicles speed onto unpaved roads and over disturbed soils.	Contractor	Inspection	One-off	5,000
	• Rapid onsite construction so as to reduce duration of traffic interference and therefore reduce emissions from traffic delays.	Contractor	Inspection	Throughout construction period	-
	• Ensure strict enforcement of on-site speed limit regulations.	Project Manager and Contractor	Observation	Construction period	No added cost
	• Avoid excavation works in extremely dry weathers.	Project Manager and Contractor	Inspection and Observation	Throughout construction period	
	• Sprinkle water on access routes when necessary to reduce dust generation by construction vehicles.	Project Manager and Contractor	Inspection and Observation	Throughout construction period	60,000 per month

	• Personal protective equipment to be worn.	Contractor	Observation	Throughout construction period	
Exhaust emission	• The engine size of the construction equipment shall be the minimum practical size.	Contractor	Inspection	One-off	No added cost
	• Construction equipment operating simultaneously to be minimized through efficient management practices.	Contractor	Inspection and Observation	Throughout construction period	No added cost
	• Construction equipment to be maintained properly tuned and maintained as per the manufacturer's specifications.	Contractor	Inspection	One-off	To be determined
	• Vehicle idling time shall be minimized.	Project Manager and Contractor	Observation	Construction period	No added cost
	• Alternatively fueled construction equipment shall be used where feasible equipment shall be properly tuned and maintained.	Project Manager and Contractor	Inspection	Throughout construction period	No added cost
	• Sensitize truck drivers to avoid unnecessary racing of vehicle engines at loading/offloading points and parking areas, and to switch off or keep vehicle engines at these points.	Project Manager and Contractor	Meeting	Throughout construction period	No added cost
Minimization of noise and vibration					
Noise and vibration	• Install portable barriers to shield compressors and other small stationery equipment where necessary.	Contractor	Inspection	One-off	50,000

	• Prescribe noise reduction measures if appropriate e.g. restricted working hours, transport hours and noise buffering.	Contractor	Inspection and Observation	One-off	No added cost
	• Consult with the surrounding community on the permissible noise levels and best working hours.	Contractor and Proponent	Meeting	One-off	No added cost
	• Use quiet equipment (i.e. equipment designed with noise control elements).	Contractor	Inspection	Throughout construction period	No added cost
	• Provide workers with earmuffs and sensitize them on their use	Contractor and Proponent	Meeting	One-off	100,000
	• Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Project Manager and Contractor	Meeting	Throughout construction period	No added cost
	• Sensitize construction 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 Manager and Contractor	Meeting	Throughout construction period	No added cost
	• Ensure that construction machinery is kept in serviced and maintained in good condition to reduce noise generation.	Project Manager and Contractor	Inspection	Throughout construction period	55,000
	• The noisy construction works will be planned to be during the day only.	Project Manager and all site foreman	Observation	Throughout construction period	No added cost

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (Ksh)
Minimization of energy consumption					
Increased energy consumption	• Ensure electrical equipment and appliances are switched off when not being used.	Contractor	Inspection and Observation	Throughout construction period	No added cost
	• Install energy saving fluorescent tubes and bulbs at all lighting points instead of bulbs which consume higher electric energy.	Contractor	Observation	Throughout construction period	35,000
	• Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts.	Contractor	Inspection and Observation	Throughout construction period	No added cost
	• Development of energy management plan.	Contractor	Inspection	One-off	To be determined
	• Monitor energy use during construction and set targets for reduction of energy use.	Contractor	Inspection	Throughout construction period	5,000
Minimize water consumption and ensure more efficient and safe water use					
Increased water demand	• Harvest rainwater.	Contractor	Observation	Throughout construction period	15,000

	• Install water conserving taps.	Contractor	Observation	One-off	120,000

	• Promote recycling and reuse of water as much as possible.	Contractor	Inspection	Throughout construction period	No added cost
	• Install a discharge meter to determine and monitor total water usage.	Project Manager and Contractor	Inspection	One-off	10,000
	• Promptly detect and repair of water pipe and tank leaks.	Contractor	Inspection and Observation	Throughout construction period	50,000
	• Sensitize construction workers to conserve water.	Contractor	Meeting	Throughout construction period	No added cost
Reduce storm-water from new impervious areas					
• Surface runoff and roof water shall be harvested and stored for reuse.		Proponent	Inspection and Observation	During rainy season	-
• Apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm		Proponent	Inspection	One-off	100,000
• Design a storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure.		Contractor	Inspection	One-off	To be determined

Minimization of oil spills

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Monitoring Means**	**Time Frame**	**Cost (Ksh)**
Oil Spills	• A designated garage section of the site fitted with oil trapping equipment to be planned for changes.	Contractor	Inspection	Throughout construction period	To be determined
	• Prompt cleaning of oil and fuel spills.	Contractor	Inspection and Observation	When there is oil spills	200,000
	• Proper disposal of clothing or rags contaminated with oil.	Contractor	Inspection and Observation	Periodically	50,000
Minimize occupational health and safety risks					
Registration of the premises	• Registration of the Project as per Section 43 and 44 of the Occupational Safety and Health Act, 2007.	Developer	Observation	One-off	To be determined
General register	• A general register should be kept within the facility as stipulated in Section 122 and 123 of the Occupational Safety and Health Act, 2007.	Project Manager and Contractor	Inspection	One-off	2,000

Incidents, accidents and dangerous occurrences.	• Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place. • Reporting should also be as stated in Section 21 of the Occupational Safety and Health Act, 2007.	Contractor	Inspection	Throughout construction phase	-

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (Ksh)
	• Enforcing safety procedures and preparing contingency plan for accident response in addition safety training shall be emphasized.	Contractor	Meeting	Throughout construction period	50,000
Safety, health and environment (SHE) policy	• Develop, document and display prominently an appropriate SHE policy for construction works.	Developer and Contractor	Observation	One-off	75,000
Health and safety committee	• Provisions must be put in place for the formation of a Health and Safety Committee, in which the employer and the workers are represented as per Section 9 of the • Occupational Safety and Health Act, 2007.	Contractor and Developer	Inspection and Meeting	One-off	-
Sanitary conveniences	• Suitable, efficient, clean, well-lit and adequate sanitary conveniences should be provided for construction workers as per Section 52 of the • Occupational Safety and Health Act, 2007.	Contractor	Inspection and Observation	One-off	To be determined

Machinery/equipment safety	• Ensure that machinery, equipment, personal protective equipment, appliances and hand tools comply with the prescribed safety and health standards and be appropriately installed maintained and safeguarded as indicated in Part VII of the Occupational Safety and Health Act, 2007.	Contractor	Inspection and Observation	One-off	No added cost
	• Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain.	Contractor	Inspection	Throughout construction period	120,000

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Monitoring Means**	**Time Frame**	**Cost (Ksh)**
	• All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury as stated in Section 56 of the Occupational Safety and Health Act, 2007.	Contractor	Inspection and Observation	One-off	40,000
	• Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/operations	Contractor	Meeting	Throughout construction period.	40,000
	• Equipment such as fire extinguishers must be examined by a government authorised person as indicated in Section 72 of the Occupational Safety and Health Act, 2007. The equipment may only be used if a certificate of examination has been issued.	Contractor	Inspection and Observation	Once every 6 months	5,000 per examination

	• Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register.	Contractor	inspection	Throughout construction period	
Storage of materials	• Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse.	Contractor	Inspection and Observation	Throughout construction period	No added value
	• Ensure that items are not stored/ stacked against weak walls and partitions.	Contractor	Inspection and Observation	Throughout Construction period	No added cost

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (Ksh)
Safe means of access and safe place of employment	• All floors, steps, stairs and passages of the rooms must be of sound construction and properly maintained.	Contractor	Observation and Inspection	One-off	To be determined
	• Securely fence or cover all openings in floors.	Contractor	Observation	One-off	To be determined
	• All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained as indicated in Section 77 of the Occupational Safety and Health Act, 2007.	Contractor	Inspection and Observation	One-off	-
Emergency preparedness and	• Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency.	Contractor	Inspection and Observation	One-off	-

evacuation procedures	• Such procedures must be tested at regular intervals.	Project Manager and Contractor	Inspection	Every 3 months	No added cost
	• Ensure that adequate provisions are in place to immediately stop any operations where there is an emergency.	Project Manager and Contractor	Inspection and Observation	One-off	-
	• Provide measures to deal with emergencies and accidents including adequate first aid arrangements.	Contractor	Meeting, Inspection and Observation	Throughout construction period	To be determined

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Monitoring Means**	**Time Frame**	**Cost (Ksh)**
First Aid	• Well stocked first aid box which is easily available and accessible should be provided within the premises as stated in Section 95 of the Occupational Safety and Health Act, 2007.	Contractor	Inspection	One-off	15,000
	• Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.	Contractor	Inspection and Observation	One-off	To be determined
Fire protection	• Firefighting equipment such as fire extinguishers and hydrant systems should be provided at strategic locations.	Contractor	Inspection and Observation	One-off	To be determined
	• Regular inspection and servicing of the equipment must be undertaken and records of such inspections maintained.	Contractor	Inspection	Every 6 months	5,000

	• Signs such as "NO SMOKING" must be • prominently displayed within the construction site.	Contractor	Inspection and Observation	One-off	1,000
Ventilation	• Enough space must be provided within the premises to allow for adequate natural ventilation through circulation of fresh air.	Project Manager and Contractor	Inspection and Observation	One-off	No added cost
Lighting	• There must be adequate provision for artificial or natural lighting in all parts of the rooms in which persons are working or passing.	Project Manager and Contractor	Inspection and Observation	One-off	-
Electrical Safety	• Distribution board switches must be clearly marked to indicate respective circuits and pumps.	Project Manager and Contractor	Inspection and Observation	One-off	-

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Monitoring Means**	**Time Frame**	**Cost (Ksh)**
	• There should be no live exposed connections.	Project Manager and Contractor	Inspection and Observation	Throughout construction period	No added cost
	• Electrical fittings near all potential sources of ignition should be flame proof.	Project Manager and Contractor	Inspection and Observation	One-off	No added cost
	• All electrical equipment must be earthed	Project Manager and Contractor	Inspection	One-off	No added cost

Chemical Safety	• Collection, recycle and dispose chemical wastes, obsolete chemicals and empty chemical containers as per the Environmental Management and Coordination (Waste • Management) Regulations, 2006.	Contractor	Inspection and Observation	One-off	To be determined
	• Ensure that all chemicals used in construction are appropriately labelled or marked and that material safety data sheets are available.	Contractor	Inspection and Observation	One-off	-
	• Keep a record of all hazardous chemicals used at the premises, cross-referenced to the appropriate chemical safety data sheets.	Contractor	Inspection and Observation	Throughout construction period	-
	• There should be no eating or drinking in areas where chemicals are stored or used.	Contractor	Inspection and Observation	Throughout construction period	No added cost
	• Provide workers in areas with elevated noise and vibration levels, with suitable ear protection equipment such as ear masks.	Contractor	Inspection and Observation	One-off	To be determined

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (Ksh)
Supply of clean drinking water	• Ensure that construction workers are provided with an adequate supply of wholesome drinking water.	Contractor	Inspection and Observation	One-off	10,000/month
Washing facilities	• Ensure that conveniently accessible, clean, orderly, adequate and suitable washing	Contractor	Inspection and	One-off	90,000

	facilities are provided and maintained within the site.		Observation		
Ergonomics	• Provision for repairing and maintaining of hand tools must be in place.	Contractor	Inspection and Observation	One-off	85,000
	• Hand tools must be of appropriate size and shape for easy and safe use.	Contractor	Inspection and Observation	One-off	-
	• Height of equipment, controls or work surfaces should be positioned to reduce bending posture for standing.	Project Manager and Contractor	Inspection	One-off	-
Ensure the general safety and security of the proposed Project and surrounding areas					
Safety and security	• Ensure the general safety and security at all times by providing day and night security and adequate lighting within and around the construction site.	Developer and Contractor	Observation	Throughout construction period	10,000/month
Labor risks including labor influx	• Local community members will be given priority in employment opportunities, in casual and unskilled labour. • Train the community on the project requirements and product.	Contractor	Register of workers engaged in the project.	Throughout construction period	-
Spread of COVID-19 amongst workers	• The Contractor will develop a SOPs for managing the spread of Covid-19. The SOPs shall be in line with the Ministry of Health	Developer and Contractor	Occurrence Registers	Throughout construction period	100,000

	directives on COVID-19 prevention, and site-specific project conditions • Install handwashing facilities with adequate running water and soap, or sanitizing facilities at entrance to work sites including consultation venues and meetings and ensure they are used.				

8.2.2 Operational phase ESMP

An operational environmental management plan provides specific guidance related to the operational activities associated with a particular project. It is focused on sound environmental management practices that will be undertaken to minimize adverse impacts on the environment through normal operation of a facility. The operational management plan further identifies what measures should be taken in the event of emergencies or incidents during the operation of the proposed Project. The roles and responsibilities for mitigation, monitoring and performance assessment for the operational life of the development are specified in the EMP. Table **13** below shows the operation phase of the proposed Soit Sugar Factory.

Table 13: Environmental and Social management plan for the operational phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party		Monitoring Means	Time Frame	Cost (Ksh)
Minimization of solid waste generation	**and ensuring more efficient solid waste management**					
Solid waste generation	Use of an integrated solid waste waste management system i.e. through a hierarchy of options: • Source reduction; • Recycling; • reuse; • Combustion; and • Sanitary land filling.	Contracted Private Solid Waste Management Company		Inspection and Observation	Throughout operational phase	500,000
	• Provide solid waste handling facilities/cubicles.	Proponent		Observation	One-off	250,000

	• Ensure that solid wastes generated at the proposed Soit Sugar factory are regularly disposed of appropriately at authorized dumping sites.	Proponent/Contracted Private Solid Waste Management Company	Inspection	monthly	100,000
Discharge of solid wastes; bagasse, sediments from various tanks/plants and distillery effluent, boiler ash	• Use of bagasse as fuel in boilers for steam and power production; making mechanical paper, drying of sediments for use as fertilizers	Factory manager	Input and output of various materials in production process.	Through ought	-
Minimize energy consumption					
High demand for energy	• Select the most efficient lighting system design and minimum lighting level appropriate for the required application in various rooms.	Proponent	Inspection	One-off	300,000
	• Adopt the most effective lighting programmable time switches.	Proponent	Inspection	One-off	No added cost
	• Maximize the contribution of daylight to reduce the use of artificial lighting.	operators	Observation and Inspection	Throughout operation period	No added cost
	• Switch off electrical equipment, appliances and lights when not being used.	operators	Inspection and Observation	Throughout operation phase	-

	• Install occupation sensing lighting at various locations such as storage areas which are not in use all the time.	Proponent	Observation	One-off	10-40 % higher than ordinary lighting
	• Install energy saving fluorescent tubes and bulbs at all lighting points within the apartments instead of bulbs which consume higher electric energy.	Proponent	Observation	One-off	200,000
	• Monitor energy use during the operation of the Project and set targets for efficient energy use.	operators	Observation	monthly	50,000
Storm water management					
Increased storm water flow	-Provision of slit traps in drains -Good housekeeping to avoid contamination of storm water. Regular inspection and cleaning of storm drains.	Proponent	Inspection	One-off	200,000
		Operators/ employees	Inspection	monthly	500,000
		operators	Inspection	monthly	50,000
Minimize water consumption and ensure more efficient and safe water use					
High water demand	• Reduce toilet cistern in single flash models.	Proponent	Inspection	One-off	No added cost

	• Sweep with a broom and pan where possible, rather than hose down external areas.	operators	Inspection	Throughout operation phase	No added cost
	• Quick fixing of licking pipes and toilet cistern.	Proponent	Inspection and Observation	Once broken and monthly	50,000
	• Reduce water delivery in taps, through the installation of low flow devices or aerators on taps.	Proponent	Inspection and Observation	One-off	-

Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Monitoring Means**	**Time Frame**	**Cost (Ksh)**
	• Install a manually pressed button flush valve which stops on release of button.	Proponent	Inspection	One-off	10-40% higher than ordinary taps
	• Install a discharge meter at water outlets to determine and monitor total water usage.	Proponent	Inspection and Observation	One-off	500,000
	• Promote awareness on water conservation and reducing water wastage.	Proponent	Meeting	Throughout operation phase	To be determined
	• Consider water efficient plumbing fixtures to save water and energy.	Proponent	Inspection	One-off	To be determined

Management of waste water disposal					
Sewage treatment and Effluent disposal	• Monitor the efficiency of the effluent treatment plant to ensure that the sewage released from the facility do not pollute the environment and affect the general public during operation of the proposed Project.	Proponent	Inspection and Observation	monthly	200,000
	• Waste water treatment at Effluent Treatment Plant • Ensure constant monitoring of the quality of the treated water to ensure it meets water quality standards of NEMA				
	• Conduct quarterly sampling and effluent analysis and apply for Effluent Discharge License from NEMA	Proponent	Analysis results EDL Licence	Qurterly and annually	150,000
Discharge of waste oil	• Minimization of oil spillage, burning of waste oil in boilers, installation of waste oil separator	Factory manager	Receipts of waste oil separator, reports of waste oil collected	Monthly	100,000
Ensure the general safety and security of the proposed Project and surrounding areas					
Increased general safety and security impacts	• Ensure the general safety and security at all times by providing day and night security and adequate lighting within and around the proposed Soit Sugar Factory.	Proponent	Inspection and Observation	Throughout operation phase	To be determined

Minimization of occupational health and safety impacts					
Increased occupational health and Safety Risks	• Ensure the general safety and security at all times	Health and Safety Manager	Inspection, Meeting and Observation	Throughout operation phase	To be determined
	• Provide PPEs to all workers, establish and mark all emergency exits and provide a first aid kit. • Enforce use of PPE Adhere to Factory Act rules • Adhere to OSHA 2007 • Activate WIBA provisions • Ensure workers are trained in ESH	Project manager	Observation Records of distributed equipment Accident records	monthly	200,000
Traffic Increase	• Ensuring clear roads without vegetation to obstruct view ahead • Install signs • Improve on the class of road • Regular maintenance and grading • Ensure the road is regularly watered to reduce dust	Proponent and County Roads Engineer	Observation	Regularly	Tendered sum
Fire Safety	• Smoke detectors installed Install fire extinguishers at strategic points • Engage services of a safety officer	Project Manager	Detectors Firefighting equipment installed Safety officer on board	Monthly	100,000

Security	• Fencing off the project site and limiting movement and attraction of unwanted characters. Ensure the sugar mill surrounding is fully lit during the nigh	Site manager	Fence and restricted entry Strict monitoring on movement of personnel and materials to and from site	monthly	80,000
Minimization of air emissions impacts					
Increased air emissions	• Use and monitor the efficiency of the equipment in trapping and neutralizing air emissions • Use appropriate fuels in boilers	Health and Safety Manager	Inspection, Meeting and Observation	Throughout operation phase	100,000 quarterly
	• Monitor stack emissions by conducting routine air quality sampling for analysis to comply with the set standards.	Health and Safety Manager	Analysis reports	Quarterly	200,000
	• Install wet scrubbers	Project manager	Monitoring reports	Once-off	Provided with equipment
Discharge of waste heat	• Use spray ponds for increased ambient temperatures and increased river water temperatures	Factory manager	Daily report of volumes pumped	400,000	
Air Discharge from flue duct/distillery	• Install wet scrubbers for flue duct and carbon dioxide scrubber for distillery	Production manager/Chief chemists	Daily check for optimal performance	Once off then continuous monitoring	3000000

Risk of social conflict	• Develop and implement local hiring rules in consultation and partnership with the local community.	• Human Resource manager	• Minutes • Reports Attendance registers	During Hiring	-
Increased risk of illicit behavior and crime	• Involve local administration and other social groups like the church in social mediation and moderation, • Establish a grievance redress mechanism where all conflicts related to the project are addressed	• Human Resource manager • Village elders and local administration	Incident Register GRMs policy	Throughout operation phase	-
Theft, vandalism and destruction of infrastructure	• Ensure the general safety and security of the facility at all times by providing day and night security guards • Ensure only authorized personnel get access to the site facility. • Install CCTV cameras	• proponent	Incident Register	Through ought	100,000 (monthly)
Spread of COVID-19	• Mandatory provision PPEs • Maintaining social distancing at least 2 meters. • All workers and visitors accessing facility every day shall be subjected to rapid Covid-19 screening which may include temperature check and other vital signs. • Install hand washing facilities with adequate running water and soap.	• Proponent	• SOPs, • Project assessment reports, • Purchase orders/receipts, • Photos	Through ought	70,000 (monthly)

8.2.3 Decommissioning phase EMP

Decommissioning refers to the formal process of removing something from the operational status. As the final phase in the project cycle, decommissioning may present positive environmental opportunities associated with the return of the land for alternative use and the cessation of impacts associated with operational activities. However, depending on the nature of the operational activity, the need to manage risks and potential residual impacts may remain well after operations have ceased. This ESMP should be treated as a guiding document that will be employed in the initial stages of the decommissioning. Detailed procedures will be developed with the cause of decommissioning in mind by competent persons and agencies. Table 14 below shows the ESMP of the decommissioning phase for the proposed project.

Table 14: Environmental management plan for the decommissioning phase

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	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	Inspection and Observation	One-off	200,000
	• 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	Inspection and Observation	One-off	200,000
	• All foundations must be removed and recycled, reused or disposed of at a licensed disposal site.	Project Manager and Contractor	Inspection and Observation	One-off	500,000
	• Where recycling/reuse is not possible, the materials should be taken to a licensed waste disposal site.	Project Manager and Contractor	Inspection and Observation	One-off	150,000
Rehabilitation of project site					

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (Ksh)
Vegetation disturbance	• Implement an appropriate re-vegetation programme to restore the site to its original status.	Project Manager and Contractor	Observation	One-off	300,000
	• Consider use of indigenous plant species in re-vegetation.	Project Manager and Contractor	Observation	One-off	-
Minimization of occupational health and safety impacts					
Increased occupational 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	Inspection, Meeting and Observation	Throughout decommissioning period	120,00
	Provision of appropriate personal protective equipment as well as ensuring a safe and healthy environment for demolition workers.	Proponent	Inspection and Observation	Throughout decommissioning period	-
	Mitigate demolition workers accidents by enforcing adherence to safety procedures and preparing contingency plan for accident response.	Health and Safety Manager	Meeting and Observation	Throughout decommissioning period	-
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 Manager and Contractor	Meeting	Throughout demolition period	No added cost
Expected Negative Impacts	**Recommended Mitigation Measures**	**Responsible Party**	**Monitoring Means**	**Time Frame**	**Cost (Ksh)**
	• 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 Manager and Contractor	Meeting	Throughout demolition period	No added cost
	• Ensure that demolition machinery is kept in good condition to reduce noise and vibration generation.	Project Manager and Contractor	Inspection	Throughout demolition period	80,000
	• Ensure that all generators and other equipment used are insulated or placed in enclosures.	Project Manager and Contractor	Inspection	Throughout demolition period	To be determined
	• The noisy construction works will be planned to be during the day.	Project Manager and all site foreman	Observation	Throughout demolition period	No added cost
Water Pollution	• Waste to be disposed off should be through a NEMA registered waste disposal company and in a designated site only. • Exhaust the septic tank, and ETP fully through a licensed exhauster	Contractor	• Receipts, • Reports, • Copies of licenses, • MoU,	3 months	550,000

	• Scoop and remediate the site from any oil spills immediately and seek advice from NEMA on how to dispose		• Photos		

CHAPTER NINE
CONCLUSION AND RECOMMENDATIONS

Conclusion

From the study 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, power generation and will create avenue for value addition projects

The proposed project will also have some negative impacts which in turn need to be minimized and mitigated during the construction and the operational phases. Based on the proposed mitigation measures, several of these negative impacts have lowered their rating to low and short-term thus, have minimal impacts.

With implementation of the ESMP, it is unlikely that the proposed Soit Sugar Factory will have any significant adverse social and environmental impacts. Most of the impacts noted will be of a temporary nature especially during the construction phase. These impacts can be effectively managed to acceptable levels with implementation by implementation of the proposed mitigation measures. Accordingly, the overall benefits from the project far outweigh the possible adverse impacts.

The proponent to be committed to putting in place several measures to mitigate the negative environmental, safety, health and social impacts associated with the life cycle of the project.

Recommendations

Given that the proponent has committed to implementing the recommendations made and put mitigation to identified impacts, the Experts hereby recommends the project for consideration and licensing. It is recommended that the proponent shall focus on implementing the measures outlined in the ESMP as well as adhering to all relevant national and international environmental, health and safety standards, policies and regulations that govern establishment and operation of such projects. It is also recommended that the positive impacts that emanate from such activities shall be maximized as much as possible. It is expected that these measures will go a long way in ensuring the best possible environmental compliance and performance standards.

Other specific recommendations that the proponent should implement include:

- Consult all relevant service providers and authorities (i.e. Narok County Government, WRA, KPLC, EPRA, Narok Water and Sewerage Company, Sugar Board of Kenya amongst others) so as to ensure compliance and harmonize the projects infrastructural and socio-economic developments with existing facilities.
- Adhere to all relevant construction, occupational, health and safety regulations and any other relevant law through ought the project.
- Ensure Water and Energy Management Systems are put in place as outlined within the report and incorporate rain water harvesting facilities.
- Ensure solid waste management during construction and operational phases of the project adhere to the Environmental Management and Coordination (Waste Management) Regulations, 2006.
- Ensure strict adherence to provisions of Environmental Management and Coordination (Noise and Excessive Vibrations Pollution) Regulations, 2009 during all phases of the project.
- Ensure waste water is disposed off as per standards set in the Environmental Management and Coordination (Water Quality) Regulations, 2006 and annually apply for EDL licence alongside conducting quarterly effluent analysis.
- Ensure strict adherence to Occupational Health and Safety Act, 2007
- Quarterly, conduct stack emissions sampling and analysis and submit the same to NEMA.

REFERENCES

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6 Wastewater reuse (IFC guideline, 1998);

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9 Environment Management and Coordination Act, (Amendment 2015) – GoK

10 Export Processing Zones – Kenya Sugar Industry 2005

11 Environmental (Impact Assessment and Audit) Regulations, 2003

12 Feasibility Studies for Soit Sugar Company by M.K Changwony & Associates

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15 Work Injury Benefits Act 2007 - GoK

16 Internet –Wikipedia, etc

17 Safety and Health Committee Rules (2004) – GoK

18 Pollution Prevention and Abatement Handbook, World Bank Group (Effective July 1998)

19 Kenya Sugar Sector Strategic Plan 5 – 10 Year Plan - December 2003

20 Intergovernmental Panel on Climate Change (IPCC). 1996.

21 Environmental Assessment Sourcebook Volume I: Policies, Procedure, and Cross-Sectoral Issues.

ANNEXES AND APPENDICES

Annexes

Annex 1: Public participation Questionnaires

Annex 2: Public Participation attendance Lists

Annex 3: Stakeholders' Participation attendance Lists

Annex 4: Minutes of Public Participation

Annex 5: Bills of Quantities (BoQ)

Annex 6: Proof of Land Ownership (Sale Agreement and Title Deed)

Annex 7: Company Registration Documents (CR12, KRA Pin, Cert of Reg)

Annex 8: Baseline water quality analysis Results

Annex 9: Experts Practicing Licenses

Annex 10: Project Designs

Appendices

Appendix 1: Ambient air Quality Analysis Report

Appendix 2: Ground Water Mapping for Soit Sugar Company