Ministry of Mining, Blue Economy and Maritime Affairs

REPUBLIC OF KENYA

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED KAKAMEGA GOLD REFINERY ON TITLE NO. KAKAMEGA/IGUHU/2658 & 2659 AT LIDAMBITSA IN KAKAMEGA SOUTH SUB-COUNTY, KAKAMEGA COUNTY

GPS Coordinates: 0.266000, 34.748591

CLIENT:	CLIENT'S REPRESENTATIVE:	CONSULTANT:
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April 2025

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ACKNOWLEDGEMENT

Knowbility Consulting Limited wishes to thank H-Nuo Kenya Company Trading Limited in conjunction with project sub-contractor Concise Projects Limited for entrusting us to conduct this Environmental and Social Impact Assessment (ESIA) study, availing the necessary documentation for the study and organising site visits.

We would also like to thank the enthusiastic community members whom we engaged throughout the public participation processes, major stakeholders involved, key informants and all parties that took part in this Environmental and Social Impact Assessment (ESIA) study.

EXECUTIVE SUMMARY

Outline

The State department of Mining under Ministry of Mining, Blue Economy and Maritime Affairs has proposed to construct the first Gold Refinery at Kakamega. The project shall be developed on 4.06 Ha and 0.67 pieces of land at Lidambitsa in Kakamega South sub-County, Kakamega County.

The proposed project consists of the following facilities:

- One storey administration block that shall accommodate offices.
- Equipment store.
- Staff accommodation which includes 1 block apartment with 20 units and 2 town houses.
- Gold processing Plant.
- Staff canteen.
- Police post.
- Drainage: The external compound shall be paved with permeable material to allow water seepage into the ground; storm water shall be channelled into natural drainage system.
- Sewage management: Since the area is not served by sewer line, all sewage waste shall be managed by septic tanks.
- Exit/entry: The project is designed to have an entry and exit on the Kisumu-Kakamega road.

Location of the Proposed Gold Refinery Project

The project shall be developed on L.R No.: KAKAMEGA/IGUHU/2658 & 2659 measuring 4.06 Ha and 0.67 at Lidambitsa in Ikolomani Sub-County, Kakamega County. Kakamega County allocated the land to the Ministry of Mining Blue Economies and Maritime Affairs for the purpose of construction afore mentioned project.

Project Objectives

The proposed project has the overall objective of constructing the gold refinery is to boost the gold mining industry, create employment opportunity, improve lively hood of the local people and boost economy of the country.

Project Justification

Gold mining has been an important economic activity in Kenya for many years, with most of the mining conducted by small-scale artisanal miners. The western part of the country, particularly

Migori and Kakamega counties, has been the most productive region for gold mining in Kenya. Despite the potential of the gold mining industry to contribute to the country's economy, the sector faces several challenges, including inadequate funding, lack of modern mining equipment, and inadequate regulations.

Artisanal miners have for the longest part exposed to middle men who buys their proceeds at a cheaper price and resale to make huge profits. Kenya does not own any gold refinery, developing the project will be important to the people of Kakamega and other gold mining regions like Narok, Vihiga, Siaya and Turkana. The projects intend to purchase unpurified gold from artisanal miners and process it to pure gold. In the process, miners will be protected from exploitations done by middle men/ gold brokers.

Above all, development projects come at a cost to the environment and therefore the ESIA study is intended to integrate environmental aspects of the project in the planning and implementation process so as to mitigate adverse impacts both social and environmental that may arise.

The ESIA study will provide decision makers, relevant organisations / institutions, the proponent and other stakeholders with a basis on which planning and decisions can be undertaken to minimise negative effects of the project and enhance the positive ones.

Policy, Legal and Regulatory Framework

- Environment Management and Coordination Act, Cap 387 & Environment Management and Coordination (amendment) Act, 2019
- Water Quality Regulations, 2024
- Management of Chemical and Hazardous Chemical Regulation 2024 Legal notice 182/2024
- Waste Management Regulations, 2024
- The sustainable Waste Management Act 2024
- Noise and Excessive Vibrations Pollution Control Regulations, 2009
- Air Quality Regulations, 2024
- Occupational Health and Safety Act, 2024
- The Climate Change Act 2024
- The Water Act, 2024
- The Public Health Act (CAP 242)
- The Physical and Land Use Planning Act Chapter 303

- The County Governments Act of 2012
- Mining Act of 2016
- The Mining (Licence and Permit) (Amendment) Regulations, 2023
- Planning and Building regulations, 2009
- The Penal Code (CAP 63)
- Occupiers Liability Act (CAP 34)
- The National Construction Authority Act, 2011

Possible Positive Impacts

The following are the possible positive impacts that can result from the proposed gold refinery project.

Table 1: Possible positive impacts of the proposed project

Impact	Remarks
Economic growth	Refining gold adds value to it therefore fetching better prices in the international market which contributes to increased income for people and revenue to the governments during operation phase of the plant.
Job opportunities	The project shall create employment opportunity during construction phase. Locals shall be employed as masonry, electricians, drivers among others. The refinery shall create employment opportunities for skilled workers in the refining process, as well as related industries like transportation and logistics. The proponent is mandated to employ and train local to provide labour on the plant during operation.
Growth of the mining sector	The refinery being the first in the country will set as an example and grow the mining sector.
Streamline gold industry	During operation phase the project shall encourage artisanal miners to sell their gold through legal channels, reducing illegal activities and improving market access.
Development in the area	Gold refinery shall attract many people from different places in need of job opportunities, business opportunities and gold merchants. The influx of people will grow the real estate industry in the area, create market for food products, housing and many other services. The community will also benefit from the royalty earned from sale of gold.
Skills transfer	The management of gold refinery through the state department of mining will train locals the emerging safe mining techniques, environmental, health and safety and rehabilitation of old mines.
Enhanced aesthetics	The project has provisions for green buffer zones and landscaping round the development. This will promote the aesthetic beauty of the project ensuring that it does not lose touch with the surrounding natural environment and landscape. It will also have the net impact purifying the air, beautifying the environment, benefitting the staff and workers' physical and mental health.
Corporate Social Responsibility (CSR)	The proposed project will come with CSR projects in the area both directly or from royalty give back from the government. Some of proposed CSR are improving water points, access roads, police station and school.
Foreign exchange earnings	Pure gold has high demand in the international market where it is used in jewellery and bank reserves. Exporting gold will earn the country foreign

	exchange which in turn will improve our currency, economy and many other benefits.
Economic utilization of idle space (optimal land use)	The development will ensure that the currently unoccupied land (proposed site) is put into economic use for maximum economic returns.
Business opportunities	Several business opportunities are anticipated around the site during construction to provide construction materials, social amenities for construction workers and many other.

Anticipated Negative Impacts

The following are the anticipated negative impacts and their mitigation measures.

Negative Impact	Mitigation Measures
Air quality degradation	- Watering of fugitive dust sources. - Minimising surface and land disturbance. - Speed control of construction and material transporting vehicles. - Use of baghouse filters for air pollution control. - Use of ultra-low sulphur diesel in vehicles, machinery, generators, among others. - -The suction hoods should adequately cover the furnace mouth and ensure that all fumes are trapped. - -The cooled emissions to be pass through series of filters which trap the air - borne particulates before going to scrubber - -The scrubber units should have alkaline solution spray to neutralize acidity if any in the fumes, strained through filters in the chimneys to remove solid particles before being released in the environment. - -Monitoring the quality of the scrub solution as well as avoiding accumulation of sludge in the scrubber tanks should be practiced ensuring efficiency of installed scrubbers. - -Stack emission sampling to be done frequently by NEMA licenced laboratories and proponent obtain emission licences annually.
Oil leak and spill	- Motor vehicles and machinery must be keenly observed and maintained to prevent oil leaks. - Maintenance services must be carried out in a designated area (protected service bays) and where oils are completely restrained from reaching the ground. - Use oil absorbent materials to manage oil spills.
Soil erosion	- Avoid unnecessary soil excavations and landscape after construction. - Use of permeable pavement materials to improve seepage. - Minimize land disturbance. - Interim reclamation.
Solid waste	- Integrated solid waste management system. - Hazardous wastes to be handled with cared on the site before disposal. - Waste disposal by a licenced entity should be at an approved dumping site. - Provision of labelled waste bins at strategic locations.
Aesthetics and visual resources	- Minimize land disturbance. - Conduct interim reclamation.
Surface water quality	- Proper erosion control measures. - Minimization of land disturbances. - Treatment of domestic wastewater before release. - Minimize potential of filtration from tailings impoundment.
Vegetation loss	- Minimize land disturbance. - Compensate affected trees by replanting others elsewhere. - Avoid chemical contamination of soil or directly on vegetation covers in the area. - Interim reclamation.
Fire hazards	- Provision of firefighting equipment and hydrant points. - Display emergency fire evacuation procedures and emergency numbers. - Provision of sufficient fire exit points and fire assembly points.

Climate Change Resilience and adaptation	- Proponent to actively participate in tree planting activities and improve carbon sinks in the area. - The proponent to consider using renewable energy sources like solar as part of climate change adaptation measures. - Practice Carbon Capture and Storage (CCS) from gold refining plant and store it underground can prevent its release into the atmosphere. - Provide civic education to local community about climate adaptation practices through practicing sustainable agriculture like reducing fertilizer and pesticide use, shifting to organic and regenerative farming, and integrating trees into farms (agroforestry) to reduce emissions from agriculture. - Avoid construction in the areas bordering R. Yala, which is a wetland and can as carbon sink.
Socioeconomics	- Maximize opportunities for women. - Maximize number of employees hired from the region. - Maximize potential for local purchases and potential development of small to medium enterprises to support the operations.
HIV/AIDS & other Sexually Transmitted Infections (STIs)	- Efficient implementation of the HIV/AIDS and STI prevention programme - Increased awareness to translate into attitudinal changes - Facilitate information sessions at worksites and allow selected workers to attend training courses - Contractor to allow selected workers to be trained and, once trained, to conduct information sessions - Trained health workers to be engaged in STI treatment - Identifying and implementing measures to ensure availability of good quality condoms to construction workers and the community - Contractor to cooperate in allowing patients to be treated - Local clinics and medical centres to cooperate in treating patients at affordable costs - Encouraging young people to abstain from sex till marriage and avoid extra marital sex in order to curb sexually transmitted disease.
Sexual exploitation, harassment and abuse	- All personnel to be sensitised about risks of sexual exploitation, abuse and harassment. - Effecting an organisational culture of zero tolerance; create and nurture an organisational culture based on accountability where there is a zero tolerance for sexual exploitation, abuse and harassment, where rights are recognized, promoted and protected and where violations are actively prevented. - Reporting mechanisms that are safe and trusted; empower and support workers and partners to feel safe to report violations and to feel safe that reports will be handled in a manner that respects due process and other human rights. - Swift and credible investigation and sanctions; ensure a fair process for swift and credible investigations and sanctions for violations by the contractor and actively promote swift and fair investigations and sanctions by the government. - Survivor-centred response; provide survivor-centred assistance and support that is timely, predictable, sustainable and adequately resourced. - Engaging partners in the fight against sexual exploitation, abuse and harassment; engage and equip individuals and local administration as allies in preventing and responding to sexual exploitation and abuse and sexual harassment.

Conclusion and Recommendations

The findings of the ESIA based on the contract document, design reports and the baseline site assessment indicated that the project is desirable and will support the realisation of national and county development goals due to the benefits that will be realised. There is need for all the

responsible stakeholders to implement the recommendations given in the ESMP to ensure sustainability of the project.

As a result of this Environmental Impact Assessment study, the following conclusions were arrived at:

- This Project is in line with the Government of Kenya's Policies as outlined in mandates of various Ministries.
- It is also in line with SDGs on poverty reduction, improved livelihoods, reduction of infection and reduction in solid waste pollution.
- The result of the assessment shows that the proposed site has got no alternative.
- There were no major complaints or concerns raised by the stakeholders that may hinder the commencement of the project.
- The mechanisms to ensure that environmental and human effects are mitigated as much as possible have been outlined in the EMMP and the time period and cost to carry out these given for the proponent and management to follow.

Having considered the information collected and analysed, the following recommendations were arrived at:

- The proponent must adhere and implement in full the proposed Environmental and Social Management Plan. The proponent must observe adherence to the legislations discussed under Legal and Regulatory chapter of this report.
- The contractor should ensure that all the construction activities are executed under supervision the activity expert to avoid substandard work at the construction and also to ensure the workers are secure and safe from carrying out the specific job.
- The contractor to deploy safety officer who will ensure that the construction area is safe both to staff and public. This can be done through barricading the construction site with safety tapes, installing warning signals, barring the public from accessing the construction site without permission from the management and ensuring all workers have proper clothing the construction.
- Ensure that worker's occupational health and safety standards are maintained through capacity building, proper training and providing protective clothing.

- The contractor or safety officer to control traffic of vehicles bringing materials and also water the dusty areas which might have significant impact on the health of public and staff members.
- Annual environmental audits should be carried out on the project in order to ensure compliance of the project with the mitigation measures outlined in the Environmental Management, and Monitoring Plan (EMMP).
- All activities concerning construction and maintenance such as, work execution, site inspection, and material testing, shall be strictly monitored by an engineer or a designated official. This is important to ensure quality of maintenance works. Engineers and/or designated official shall be trained and experienced enough to judge the appropriateness of the work executed in order to carry out the monitoring properly.
- Portable toilets facility to be provided during construction to manage human waste.
- The community to ensure they enter an agreement with the contractor and avoid brokers when leasing/selling out land for borrow-pits. Also, the community to ensure a clause that states "timely backfilling and rehabilitation after excavation" is included in the contract so as to bind the contractor. The community to approach the contractor and where possible dump the top soil/spoil in their old borrow-pits.
- Relevant signals showing direction and warnings to be erected within the site to offer rightful information to people.
- Overall, the experts conclude that the project is environmentally, socially and economically feasible and should be allowed to be implemented or as per NEMA discretion.

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ACRONYMS AND ABBREVIATIONS

CIDP	County Integrated Development Plan
DWWT	Decentralised Waste Water Treatment
EA	Environmental Audit
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMMP	Environmental Management and Monitoring Plan
ESIA	Environmental Social Impact Assessment
GDP	Gross Domestic Product
GPS	Global Positioning System
KACWASCO	Kakamega County Water and Sanitation Company
KES	Kenya Shilling
KNBS	Kenya National Bureau of Statistics
KPLC	Kenya Power and Lighting Company
NEC	National Environmental Council
NEMA	National Environment Management Authority
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
ToR	Terms of Reference
WHO	World Health Organisation

GLOSSARY OF TERMS

Technical Term	Denotation
Air quality	means the concentration prescribed under or pursuant to the Environment Management and Coordination Act 1999 of a pollutant in the atmosphere at the point of measurement.
An amalgam	it is an alloy of mercury with another metal. It may be a liquid, a soft paste or a solid, depending upon the proportion of mercury.
Analysis	means the testing or examination of any matter, substance or process for the purpose of determining its composition or qualities or its effect (whether physical, chemical or biological) on any segment of the environment.
Artisanal mining	is a type of subsistence mining where individuals or small groups extract minerals from the earth using basic tools or low-tech equipment.
Biological diversity	means the variability among living organisms from all sources including, terrestrial ecosystems, aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, among species and of ecosystems.
Ecosystem	means a dynamic complex of plant, animal, micro-organism communities and their non-living environment interacting as a functional unit.
Effluent	means gaseous waste, water or liquid or other fluid of domestic, agricultural, trade or industrial origin treated or untreated and discharged directly or indirectly into the aquatic environment.
Environment	includes the physical factors of the surroundings of human beings including land, water, atmosphere, climate, sound, odour, taste, the biological factors of animals and plants and the social factor of aesthetics and includes both the natural and the built environment.
Environmental and Social Assessment (Assessment)	is a process that determines the potential environmental and social risks and impacts (including labour, health, and safety) of a proposed Project in its area of influence.
Environmental and Social Impact Assessment (ESIA)	is a comprehensive document of a Project's potential environmental and social risks and impacts. It is a process which ensures that all environmental matters are considered quite early in the project at planning process itself. It takes into consideration not only technical and economic considerations but also, traditional aspects like impact on local people, biodiversity among others.
Environmental management	includes the protection, conservation and sustainable use of the various elements or components of the environment.

Technical Term	Denotation
Environmental Management and Monitoring Plan (EMMP)	is an action plan taking the results of an environmental assessment or checklist and turning them into a plan to address and mitigate the issues identified.
Environmental monitoring	means the continuous or periodic determination of actual and potential effects of any activity or phenomenon on the environment whether short-term or long term.
Focus Group Discussion	is a qualitative data collection method that engages 6 to 12 people with shared characteristics pertinent to the specific discussion topic and is led by a trained facilitator.
Natural resources	include resources of the air, land, water, animals and plants including their aesthetic qualities.
Noise	means any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health or the environment.
Ozone layer	means the layer of the atmospheric zone above the planetary boundary layer as defined in the Vienna Convention for the Protection of the Ozone Layer, 1985.
Pollutant	includes any substance whether liquid, solid or gaseous which. - may directly or indirectly alter the quality of any element of the receiving environment. - is hazardous or potentially hazardous to human health or the environment; and includes objectionable odours, radioactivity, noise, temperature change or physical, chemical or biological change to any segment or element of the environment.
Pollution	is the introduction of contaminants into the natural environment that cause harm to human, animal and plants.
Scoping	is a process of interaction between government agencies and project proponents. Scoping identifies; spatial and temporary boundaries for the EIA, important issues of concern, information necessary for decision making, significant effects and factors to be considered and lastly establishing terms of reference of full-scale EIA.
Screening	is the process used to determine whether a proposed project or activity requires an EIA and, if so, what level of environmental review is necessary.

CHAPTER 1: INTRODUCTION

1.1 Overview of Mining Sector in Kenya

Kenya hosts a variety of mineral deposits, mines and exploration projects. The country-wide airborne geophysical surveys are expected to generate many new exploration targets and to contribute to fully appraise Kenya's real potential for mineral development.

Kenya has a vibrant limestone mining and cement manufacturing industry, with players such as Bamburi Cement, Athi River Mining and East African Portland. Until recently, the country was producing about 150,000 tons per year of fluorspar. The mine closed, but there are various plans to revive it as the resource is not exhausted. Other industrial minerals development opportunities include diatomite, vermiculite, baryte, bentonite, gypsum, graphite.

The country also has significant potential for gold production, in particular in the Nyanzan greenstone belts of Western Kenya, where artisan mining is rife. Acacia Mining recently defined a maiden resource of 1.31 Moz at 12.1 g/t at the Liranda Corridor. Karebe Mining (near Kisumu) and Kilimapesa Gold (in Lolgorien) are fully mechanized small-scale operations which have been producing gold for a few years. Kenya offers significant potential for the development of formal small-scale gold mines. These typically a higher ratio of jobs created per ounce produced than large-scale mines, and thus a strong positive economic impact on rural communities.

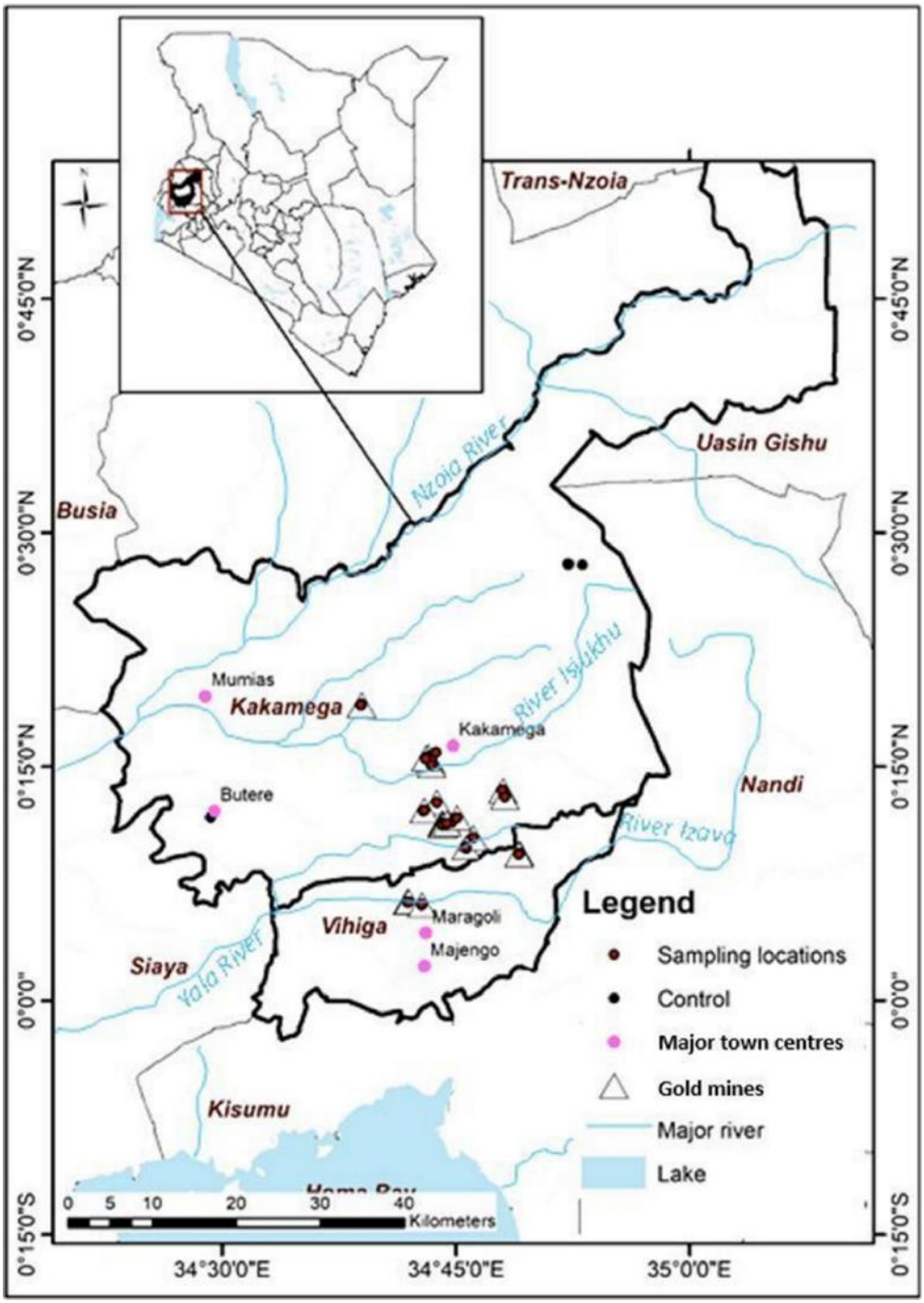
1.2 Gold Mining in Kenya

Gold is a chemical element with the symbol Au (from the Latin word "aurum," meaning "shining dawn") and atomic number 79. It is a highly valued precious metal used for coinage, jewellery, and other decorative purposes for thousands of years. Gold is also used in electronics, aerospace technology, and medicine.

Gold mining has been an important economic activity in Kenya for many years, with most of the mining conducted by small-scale artisanal miners. The western part of the country, particularly Migori and Kakamega counties, has been the most productive region for gold mining in Kenya. However, gold deposits have also been found in other parts of the country, such as the Vihiga, Narok, Siaya, and Turkana counties. Despite the potential of the gold mining industry to contribute to the country's economy, the sector faces several challenges, including inadequate funding, lack of modern mining equipment, and inadequate regulations.

The figure1 below shows gold mining sites in Kakamega and Vihiga County which will greatly benefit from the proposed Gold Refinery.

Figure 1: Gold Mining Sites in Kakamega and Vihiga County



Source: Environ Geochem Health (2023)

Gold Mining in Kenya is majorly undertaken by Artisanal Miners. Artisanal small-scale gold mining (ASGM) is also common in many other developing countries. However, this practice often

has a deadly toll on the environment and human health. In Kenya, ASGM has been associated with releasing toxic mercury into the environment, leading to serious health risks for miners and nearby communities. Artisanal miners in the country rely on rudimentary tools and techniques to extract gold from the earth.

1.2.1 The Poisoned Promise of Artisanal Gold Mining

The artisanal miners typically work in small groups, using manual labor to dig and extract the ore. The ore is then processed using mercury, a highly toxic element that binds with the gold and forms an amalgam. Mercury in ASGM is a major cause of environmental pollution and poses significant risks to human health. When mercury is released into the environment, it contaminates water bodies, soil, and air. This contamination can lead to serious health risks to both human, domestic animals and wildlife. Exposure to mercury can cause neurological damage, kidney damage, respiratory problems, and other health issues.

1.2.2 Gold Mineral Earnings In Kenya

Kenya's earning from gold doubled in 2022 to approximate figure of 3.4 million from 1.4 million in 2021. The phenomena have been contributed by discovery of new gold mining areas in Vihiga, Turkana and Nandi County. The quantity extracted doubled from 291.5kg to 563.6kgs. Other factors contributing to rise in the earning rise in the global prices; poor yield sin agricultural sector forcing people to venture into mining among other factors.

1.2.3 Background to the development

Worldwide, the need to pursue sustainable development guided by environmental, social, cultural and ethical considerations has been accorded high priority. The goal of Sustainable Development cannot be achieved without significant changes in the way's development initiatives are planned, implemented and managed. In order therefore to achieve these changes, humanity has to consider as a matter of priority environmental conservation, protection and security as essential elements of the entire process of sustainable development. The resent development on climate change abatement strategies have drawn all government to work on their NDC towards the fight on greenhouse gases. Concerning mitigation components' goals, the NDC seeks to abate greenhouse gases emissions by 32% by 2030 in line with Kenya's sustainable development agenda through a low carbon and climate resilient development pathway, covering the following sectors: energy;

industrial processes and product use; agriculture; land-use; forestry; waste, and dealing with the following gases: Carbon dioxide (CO2); methane (CH4); and nitrous oxide (N2O). The NDC tries to bear 21% of the mitigation costs from domestic sources and the remaining 79% from international support, in the form of finance, technology, development and transfer and capacity building

Kenya has made significant steps in the implementation of environment-friendly legislations, significant of which is Chapter 69 of the Constitution ensures sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits while and Environmental Management and Coordination Act (EMCA) 1999. EMCA 1999 makes Environmental Impact Assessment an essential element in the overall project management cycle.

1.2.4 Environmental and Social Impact Assessment (ESIA)

The Environmental and Social Impact Assessment (ESIA) Study was carried out with the aim of identifying both the negative and positive impacts of the project and formulate a sustainable Environmental and Social Management Plan (ESMP) in accordance with the requirements of the Environmental (Assessment and Audit) Regulations, 2003, legal notice 31 &32 of 2019 pursuant to the Environmental Management and Coordination Act, (EMCA) Cap 387. This would guide the decision and policy makers on appropriate ways to handle the pertinent environmental issues that may arise during the project life and afterwards. Several adverse impacts, ranging from wildlife habitat destruction, changes in ecological setup, human displacement, and environmental pollution to cultural disorientation need keen appraisal so as to achieve fairly less retrogressive impacts from such development.

Economic benefits from the Kakamega Gold Refinery would support the realisation of the regional and national development goals, hence alleviate poverty in the long run. The project area has high potential for gold ore which is majorly mined through ASGM. Developing the refinery shall benefit the ASGM through elimination of brokers who buys the mined gold at lower price.

1.3 Project Background

The Mining, Blue Economy and Maritime Affairs proposed to construct the first Gold Refinery in Kenya at Lidambitsa in Kakamega. This is hailed as a major boost to the gold miners in the region.

The refinery is set to purchase unrefined gold from Artisanal Miners and refine it to 99.99% pure gold bars for export. The project is jointly funded by the government and private investor under the programme of Public Private Partnership. The Ministry through State department of Mining awarded the contract to H-Nuo Kenya Company Trading Limited after competitive tendering process.

The project shall be developed in two Phases. The first phase which the ESIA covers as per now will be construction of servant quarters, laboratory, security units and stores.

1.4 Purpose and Terms of Reference

1.4.1 Purpose

The purpose and terms of reference developed for this study was to assess the impacts that may result during the construction and operational phases of the proposed Kakamega Gold Refinery project.

1.4.2 Terms of Reference

Specifically, the terms of reference (as guided by the Kenya Environmental Impact Assessment and Audit Regulations of 2003 and EMCA, 1999) developed for this study shall cover:

- The description of the proposed gold refinery project.
- An in-depth description of the national and local environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project.
- Description of the project objectives.
- The employed technology, procedures, and processes for the implementation of the project.
- The materials to be used in the construction and implementation of the project.
- The products, by-products and waste to be generated by the project.
- A description of the potentially affected environment.
- The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated.
- Recommendation of specific and environmentally sound waste management system.
- Analysis of alternatives for the: project site, design and technologies.
- An Environmental Management and Monitoring Plan (EMMP) proposing the measures for mitigating adverse impacts on the environment.

- A monitoring plan for the prevention and management of the foreseeable accidents and hazardous activities in the cause of carrying out development activities.
- Proposed measures for the prevention of health hazards and the ensuring of security in the working environment for the employees, local community and for the management in case of emergencies.
- Economic and social analysis of the project.
- Such other matters as may be directed by the NEMA.

1.5 Project Objectives

The Proposed Kakamega Gold Refinery is expected to meet the following objectives and service needs both during construction and operation phases of the project:

- Create employment opportunity to local people of Kakamega County and extended region within the country.
- Economic growth in Kakamega county and surrounding gold mining counties through export of gold, creation employment and business opportunities.
- Development- Gold refinery will greatly impact on development in the area through attracting other investors real estate and other commercial sectors.
- Empower artisanal miners through providing ready market for their gold at fair price, impact on the mining technology and trainings.
- Create alternative source of income to locals who depends on mainly agriculture that has less income as compared to gold industry.

1.6 Justification for the proposed Gold Refinery

Gold mining has been an important economic activity in Kenya for many years, with most of the mining conducted by small-scale artisanal miners. The western part of the country, particularly Migori and Kakamega counties, has been the most productive region for gold mining in Kenya. Despite the potential of the gold mining industry to contribute to the country's economy, the sector faces several challenges, including inadequate funding, lack of modern mining equipment, and inadequate regulations.

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Above all, development projects come at a cost to the environment and therefore the ESIA study is intended to integrate environmental aspects of the project in the planning and implementation process so as to mitigate adverse impacts both social and environmental that may arise.

The ESIA study will provide decision makers, relevant organisations / institutions, the proponent and other stakeholders with a basis on which planning and decisions can be undertaken to minimise negative effects of the project and enhance the positive ones.

1.7 Location of the Proposed Gold Refinery Project

The project shall be developed on L.R No.: KAKAMEGA/IGUHU/2658 & 2659 measuring 4.06 Ha and 0.67 at Lidambitsa in Ikolomani Sub-County, Kakamega County. Kakamega County allocated the land to the Ministry of Mining Blue Economies and Maritime Affairs for the purpose of construction afore mentioned project.

Photo 1: Picture of the proposed Kakamega Gold Refinery Site

Source: Field survey, 2025

1.8 The Scope of Gold Refinery Works

The major works to be executed under the Construction contract comprise mainly of but are not limited to the following: -

- Provision of facilities to the Project's Resident Engineers
- Site clearance and top soil removal
- Earthworks
- Laying of foundations and utility lines
- Construction of proposed structures
- Site land scaping and removal of debris for disposal at a licenced waste site

1.9 Objectives of the ESIA Study Consultancy

The overall objectives of the consultancy by Knowbility Consulting Limited are to: -

- Consider environmental, social, economic, cultural and legal considerations in regard to the proposed project construction and operation activities.
- Identify the likely environmental impacts of the proposed project and the scale of the impacts.
- Analyse and evaluate the anticipated impacts of the proposed refinery works on the physical, biological, social-cultural and social economic environment.
- Identify and analyse alternatives to the proposed project.
- Evaluate the Gold Refinery design proposed in the engineering report and consider its effects on safety, comfort and convenience of the workers and processes.
- Propose mitigation measures to be taken during and after the implementation of the construction and operation works.
- Develop an environmental management plan with mechanisms for monitoring and evaluating the compliance and environmental performance which shall include the cost of mitigation measures and the time frame of implementing the measures.

1.10 Scope of Consulting Services

1.10.1 Description

The assignment consisted of: -

- Identification and analysis of the anticipated impacts of the proposed construction works on the physical, biological, social-cultural and socio-economic environment.

- Review of the existing data on the proposed gold refinery construction and operation works including social and economic activities within the project study area.
- Identify the impact on the mining sector that shall be as result of developing the project in the area.
- Production of an Environmental and Social Impact Assessment (ESIA) Study Report for the proposed construction works and seeking the necessary approval for the issuance of a License by NEMA. This shall be in accordance with the general Environmental Impact Assessment guidelines outlined in the Environmental (Impact Assessment and Audit) Regulations, 2003, and administrative procedures issued by NEMA.

1.10.2 Detailed Scope of the Consulting Services

The experts conducted an analysis which detailed the positive and negative effects of the project on the environment and prepared an ESIA Study report recommending appropriate solutions to minimize any undesirable effects resulting from construction of the Gold Refinery in Kakamega. The analyses included, but were not limited to the following:-

- Description of the baseline environment.
- Data analysis and evaluation of alternatives.
- Legislative and regulatory framework.
- Determination of impacts of the Gold Refinery project.
- Occupational health and safety concerns.
- Identification and development of management plan to mitigate negative impacts.
- Development of monitoring plan.
- Identification of procedures for winding up of the project.
- Identification of benefits.
- Consultation and public participation.

1.11 Data Collection Methods and Procedures

The data collection was carried out through questionnaires/standard interview schedules, key informant interviews, focused group discussions, use of checklists, observations and photography, site visits, and desktop environmental studies, where necessary in the manner specified in the Environmental (Impact Assessment and Audit) Regulations, 2003.

As stated earlier, the ESIA Study was carried out in compliance with the government of Kenya's Environment Management and Coordination Act of 1999 and the Environmental (Impact Assessment and Audit) Regulations 2003, World Banks Environmental and Social Performance Standards and Equator Principles among other relevant laws, regulations and guidelines standards.

The general steps followed during the assessment were as follows:

- Environment screening, in which the project was identified as among those requiring environmental impact assessment under schedule 2 of EMCA, 1999.
- Environmental scoping that provided the key environmental issues.
- Desktop studies.
- Physical inspection of the area and surrounding areas.
- ESIA Public participation via the use of questionnaires/interviews/meetings/focused group discussion.
- Data analysis, and
- Report preparation.

1.11.1 Environmental Screening

This step was conducted through legal review and desktop studies to assess whether there will be a need for an environmental and social impact assessment, and what level of assessment is necessary. This was done using a screening checklist in reference to requirements of the EMCA, 1999, and specifically the second schedule. Given the scale and the impact level of the proposed project, a comprehensive Environmental and Social Impact Assessment study was opted for to ensure comprehensiveness and completeness of the assessment. Issues considered included the physical location, sensitive issues and nature of anticipated impacts.

1.11.2 Environmental Scoping

The scoping process, through an ESIA scoping checklist, was conducted to help narrow down onto the most critical issues requiring attention during the assessment. Environmental issues were categorised into physical, natural/ecological and social, economic and cultural aspects. It also included discussions with key stakeholders and design engineers as well as interviews with the local communities.

1.11.3 Desktop Study

Desktop study included document review on the nature of the proposed activities, project documents, designs, policy and legislative framework as well as the environmental setting of the area among others. The key documents reviewed included the following: -

- Kenya National and County Laws
- IFC Standards and guidelines
- Equator Principles
- Applicable MEAs
- Previous related ESIA reports

1.11.4 Site Assessment

Field visits were made for physical inspections of the areas along the project site and the environmental status of the surrounding areas to determine the anticipated impacts.

1.11.5 Public Participation

Public participation meeting was conducted at the project site, Lidabitsa in Ikolomani Sub-County and a Focus Group Discussion (FGD) at the gold mining site. To ensure adequate public participation in the ESIA process, questionnaires were administered to the local communities, leaders, and the information gathered was subsequently synthesized and incorporated into the ESIA Report. The consultant incorporated the concerns and views of all stakeholders and the affected people.

1.11.6 Data Analysis, Reporting and Documentation

Data was quantitatively and qualitatively analysed in terms of themes. The ESIA report was compiled from the findings in accordance with the guidelines issued by NEMA for such works and prepared and submitted by the proponent for consideration and approval. The Consultant ensured constant briefing of the client during the exercise. Description plans and sketches showing various activities are part of the Appendices.

1.12 ESIA Organization and Structure

Based on the existing information, the ESIA study was carried out to full completion within a period of 45 days and processing is estimated to take another 45 days from the date of undertaking.

The Consultant (Lead Expert) coordinated the day-to-day functions and any related institutional support matters.

1.13 Team Composition

The EIA team members are covered in the table below.

Table 2: ESIA study team composition

Name	**Position**	**NEMA Reg. No.**
Kuloba Abraham	Lead EIA Expert & Sociologist	10709
Gregory E. Odawo	Geologist/Mining Expert	-
Prof. Caleb Mireri	Planner	2539
Oscar Wekesa	EIA/OSH/EHS Expert	8238
Eng. Oscar Wafula	Civil Engineer	-
John Kuloba	Lead EIA Expert	1018
Margaret Waithera Wanja	Environmental Engineer	11292

1.14 Estimated Project Cost

The first phase of the proposed project is estimated at KES. 189,672,925.00 (One hundred eighty-nine million, six hundred seventy-two thousand, nine hundred twenty-five shillings).

CHAPTER 2: PROJECT DESCRIPTION

2.1 Nature of the Project

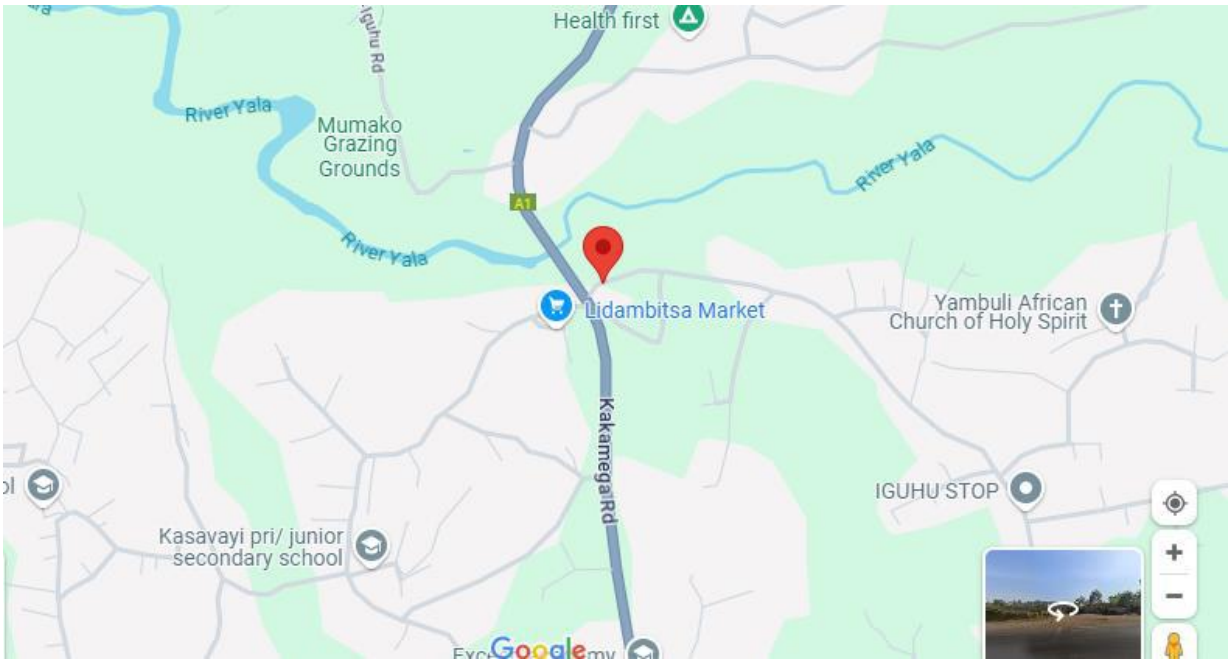
The proposed project is classified under 'High risk projects' in the Legal Notice No. 31, issued on 30th April, 2019.The project is a gold refinery factory which shall be equipped with laboratory where unrefined gold with approximate 90% purity shall be refined to 99.99% gold bars for market purposes. Architectural designs and project layout plan are illustrated below.

Photo 2: Proposed project site layout plan

2.2 Project Location

The proposed Kakamega Gold Refinery is located on L.R NO: KAKAMEGA/IGUHU/2658 & 2659 at Lidambitsa in Kakamega South Sub-County, Kakamega County. The site can be accessed via Kakamega Kisumu Highway approximately 20km from Kakamega Town. The corresponding area coordinates are 0.158580 Sand 34.744834 E. Notable neighbouring facilities include River Yala bridge, Iguhu Hospital and Iguhu Police Station.

Figure 2: Google Earth view of the proposed project site



Source: Google Earth, 2025

2.3 Current Project Site Status

The proposed project site is a fallow land bordering River Yala and Kakamega- Kisumu Highway. The site has a perimeter wall, reeds and some shrubs.

Photo 3: Current state of the proposed project site

Source: Field survey, 2025

2.4 Field Findings

2.4.1 Economic Activities

Most people in Kakamega South Sub-county practice mixed farming ranging from crop, cattle, poultry and pigs. Main cash crops grown near the site is tea, maize, beans, bananas among others.

Photo 4: Photo of tea and banana plantations at Ivonda location

Source: Field survey, 2025

2.4.2 Artisanal Gold Mining

Gold Mining in Kakamega County is mainly done by artisanal and small-scale Miners. According to State Department of Mining, there are about 80,000 artisanal miners in Kakamega South Sub-County. Most residents have turned their farmlands into mining site.

Photo 5: Rock crusher equipment and gold mining site at Ivonda

Source: Field survey, 2025

2.4.6 Water Sources, Rivers and other Streams

The proposed project site neighbours R. Yala one of large permanent Rivers in Kakamega County. There are several other streams nearby which are likely to be affected by proposed project and mining activities. Other sources of water for locals are springs, wells and boreholes.

Photo 6: River Yala

Source: Field survey, 2025

2.5.7 Social amenities and infrastructure

The project site boarders several social amenities. They include Iguhu Hospital, Iguhu KMTC, Iguhu Police station, Shisesya Primary School, Ivonda Primary School, Ivonda Friends Church among Others.

2.5 Project Design and Description

The project shall be developed on 4.06 Ha and 0.67 pieces of land at Lidambitsa in Kakamega South Sub-County, Kakamega County. The project shall consist of the following facilities:

- One storey Administration block that shall host offices
- Equipment store
- Staff accommodation which includes 1 block apartment with 20 units and 2 town houses.
- Processing Plant
- Gold Refinery
- Staff Canteen
- Police Post
- Drainage: The external compound shall be paved with permeable material to allow water seepage into the ground; storm water shall be channelled into natural drainage.

- Sewage management: Since the area is not served by sewer line, all sewage waste shall be managed by constructed septic tanks
- Exit/entry: The project is designed to have its entry/exit on Kisumu-Kakamega road.

2.6 Project Technology

Some of the equipment to be used for this project will include earth moving equipment, survey equipment, concrete mixer plant & mixer truck, reinforcement bending and cutting machine, carpenter equipment, tower crane/mobile crane, mechanic equipment and tools, scaffolding materials, formwork materials, among others.

2.7 Project Activities

The proposed project building is designed into reinforced concrete frame structure. Related equipment and turnover materials shall be delivered and removed from site, such as earth moving equipment, survey equipment, concrete mixer plant and mixer truck, reinforcement bending and cutting machine, carpenter equipment, tower crane/mobile crane, mechanic equipment and tools, scaffolding materials, formwork materials, etc. And all required materials shall be delivered to site, such as reinforcement, cement, aggregate, sand, stone dust, plumbing and drainage materials, electrical and ICT materials, landscaping materials, AC materials, building chemical materials, waterproofing materials, finishing materials including doors and windows and curtain walls, ceiling materials, floor finishing materials, wall finishing materials, sanitary materials and furniture, among others.

2.7.1 Preconstruction Activities

The main project activities during this phase included:

- Carrying out feasibility studies.
- General designing and planning of the proposed arcade project and its associated infrastructural facilities.
- Designing and drawing of site architectural plans and designs including resurveys and correcting any discrepancies between site and design drawings, review opinions on designs.
- Survey and detection of underground utility facilities and infrastructures e.g., water pipes, internet fibre optic cables, and power lines, among others.

- Application for various permits, licenses and leases, etc., from relevant government authorities and agencies.
- Procurement of construction materials e.g., cement, sand, EPS panels, timber, ceramic tiles, stone coated tiles, windows, doors, among others.

2.7.2 Project Construction Activities

The main project activities will include:

- Survey and site clearance.
- Foundation pit excavation and backfilling.
- Concrete mixing, casting and curing.
- Reinforcement preparation and installation.
- Formwork preparation, installation and removal.
- Scaffolding installation and removal.
- Block preparation and masonry.
- Mortar mixing and plastering.
- Service work installation and testing.
- Waterproofing material preparation, installation and testing.
- Finishing material preparing and installation, among others.
- Material and equipment delivery to the site.
- Civil work involving mostly stabilizing of soils on cut embankment.
- Structural work which will involve implementing all works to structural engineer’s details, determining the depth of the building foundation and wall reinforcement.
- Mechanical works involving mainly all plumbing and drainage works, all floors accessible service ducts, inspection plates in all bends, deep seal or anti-vac to all fittings connected to the SVP’s and waste pipes, encasing of underneath drain pipes, testing of pipes before plastering, and the coordination of mechanical and electrical works, air conditioning, air extraction system, mechanical ventilations in the washrooms.
- Electrical works involving laying of all conduits, and coordination of electrical and mechanical works, CCTV connections, ICT and wireless internet connections.
- Fire work system: installation of fail-safe sprinkler system, fire hydrant and extinguishers, fire suppression in control rooms and fully zoned fire detection and alarm system.

- Control systems installation including water supply control and fault detection system, power supply control and fault detection system including generators, lighting control and fault detection system, air conditioning, air quality, ventilation control and fault detection system, fire sprinkler, detection and alarm control and fault detection system.
- Mobilization of required equipment, machineries, labour, and plants for soil excavation. levelling, compacting and material transportation, concrete mixers and transporting trucks.
- Materials mobilisation: transportation of the required construction materials to the site.
- Site clearance, excavation (earthworks) works, land filling and levelling off the ground.
- Masonry work, concrete mixing, plumbing, painting works, and steel fabrication.
- Roofing works, landscaping, gardening.
- Development of vehicle parking and walkway network.
- Occupation of the buildings upon the inspection and issuance of an occupation certificate.

2.7.3 Project Operation Activities

During the operation phase, project activities will mainly include:

- Issuance of occupation certificate by the county and national government inspector to ensure that the building is safe, ready and to the required construction standards for habitation.
- Issuance of NEMA decommissioning license upon submission of a decommissioning report to NEMA.
- Occupation of the resultant development project.
- Waste water management plan in place.
- Rainwater harvesting and storage plan in place.
- Solid waste and waste water management.
- General maintenance and repairs.
- General cleaning and hygiene.

2.7.4 Other Project Activities

Other project activities will include:

- Site restoration to near original condition.
- Delivery and removal of equipment and turnover materials from site, such as earth moving equipment, survey equipment, concrete mixer plant & mixer truck, reinforcement bending and

cutting machine, carpenter equipment, tower crane/mobile crane, mechanic equipment and tools, scaffolding materials, formwork materials, etc.

- Delivery of all required materials to the site, such as reinforcement, cement, aggregate, sand, stone dust, plumbing and drainage materials, electrical and ICT materials, landscaping materials, AC materials, building chemical materials, waterproofing materials, finishing materials including doors, windows and curtain walls, ceiling materials, floor finishing materials, wall finishing materials, sanitary materials and furniture, etc.

2.8 Project Inputs

The project will employ modern, locally and internationally recognized and certified materials to ensure for public health safety, security and environmental aesthetic requirements of the project area. Some of the key conventional materials to be used in the implementation of the proposed project will include concrete mixture from quality cement, sand, ballast; water; steel and iron metals; red volcanic soil, reinforcement, aggregate, stone dust, plumbing and drainage materials, electrical and ICT materials, landscaping materials, AC materials, building chemical materials, waterproofing materials, finishing materials including doors, windows and curtain walls, ceiling materials, floor finishing materials, wall finishing materials, sanitary materials and furniture, water and oil-based paints, among other notable materials.

2.9 Project Products and By-Products

2.9.1 Project Products

Project products are the final substances or outcome of the project. The expected product from this development project is a gold refinery which shall consist of several departments from accommodation, production line, administration, security, parking bays, among others as seen in the drawings.

2.9.2 Project By-Products

By-products are secondary products resulting from the project implementation process and are not beneficial to the process. The major by-products expected from the project will mainly include greenhouse gases and other harmful gases (Ammonia, Sulphur, Acids, Dioxin, Naphthalene, Carbon Monoxide, Sulphur Dioxide, among others), emanating from construction equipment, machines and heavy vehicles; waste water from the washrooms, kitchenette, and those used in the

cooling and cleaning of the equipment, machines and heavy vehicles; waste construction materials; solid wastes like leftover concrete materials, cement bags, among other notable materials.

2.10 Project Wastes

There will be liquid, solid and gaseous wastes from project activities during construction, operation and decommissioning phases. There shall be wastewater from civil works, washrooms, kitchenette and the storm drain. During construction stage sanitary waste shall be managed through an onsite septic tank for safe effluent disposal and management since the area does not have sewer connection. Oil/fuel leak and grease from the generator as well as the construction equipment will be managed through the installation of oil interceptors and oil water separators to ensure that the oil from machines/equipment servicing works do not mix with the storm water in storm drains.

(a) **Solid wastes:** These will include heaps of sand and aggregates, bits and pieces of various pipe types, cans of paint, polythene sheets, pieces of iron sheets, food waste, paper packing materials, pieces of timber, pieces of iron (metals) among others scattered within the project site. The main types of solid wastes expected during the operation stage of the proposed project will be paper bags, paper/card boxes, packing bags, food leftovers and plastics. Other solid waste products expected will include empty chemical containers, paints filters, sludge and used oil/grease cans, etc. These waste materials shall be separated and sorted at the source and disposed into NEMA designated dumpsites or recycled in NEMA accredited recycling facilities through contracted NEMA licensed waste handlers.

(b) **Liquid wastes:** These will mainly originate from the cleaning of construction equipment, heavy machinery and machines; washrooms; the generator area (grease, oil and fuel leaks); water used for cooling the equipment and machines; storm drains; water from mixing solvent and oil-based paints; and other areas like office, kitchen and washrooms. All waste water from washrooms and kitchen will be channelled into an onsite septic tank for safe disposal and management as the area does not have sewer connection. Liquid wastes from the construction equipment and machines as a result of cooling and heating of the equipment and machines will be recycled through reuse to ensure for water use efficiency and sustainability. Storm water will be disposed into the constructed and existing storm drainage channels in the area while the leaked fuel and oil will be sold to contracted licensed waste oil dealers in the area. Empty oil and grease cans emanating from use of

petroleum products, e.g., grease, coolant etc. for generator servicing, maintenance and other machineries and equipment, pieces of garments. Used containers made from petroleum products as well as the used rags for cleaning the spills and excess grease during lubrications and maintenance of machineries and equipment will be collected safely and sold to petroleum dealers or licensed waste oil dealers in the area or be disposed in line with NEMA stipulated guidelines.

Hazardous waste during operation shall consist of mercury deposits from amalgam, chemical used in the laboratories and other heavy metals. All these wastes shall be handled carefully by experts to be reused in other sector.

(c) **Demolition wastes:** These will result from demolished structures. They include old buildings, salvaged equipment, cables, infrastructural components, sign boards, left over steel metals, concrete slabs, premix concrete stones, cement plaster, steel metals and plumbing material wastes from weep holes, etc. These shall be recycled and re-used elsewhere while the non-reusable ones shall be taken to accredited dumpsites run by NEMA licensed waste handlers who have complied with the Environmental Management and Coordination (Solid Waste Management Regulations) Act of 2006 requirements.

Waste management will be carried out as the principal objective aimed at minimizing the pollution of the environment as well as utilizing the wastes as a resource. This goal will be achieved in a way that is environmentally and financially sustainable.

2.11 Project Decommissioning

This is the last stage of project implementation cycle and involves mainly the proposed development project lifetime and operation coming to an end. This will render the project inactive implying that the project ceases to carry out its operations. It will mainly involve sustainable storage, selling, disposal and transfer of project machineries, equipment and other related project infrastructures and facilities as per the existing contractual agreements, legal stipulations and laid down procedures.

2.12 Operation Phase Activities

Upon completion of construction phase, the next phase shall be operation phase. The proponent shall manage the development through State Department Mining. This phase shall involve the following:-

- Administration activities: This involves officials who will run the gold refinery.
- Equipping of the factory: These equipment and requirements for the gold processing. It will involve importation of machines, assembling and testing works
- Purchasing and refining of gold: Gold ore from the artisanal miners will be bought processed to gold bars for marketing purposes.
- Solid waste and waste water management: The proponent shall provide skips for temporary holding of the solid waste before final disposal by the contracted licensed solid waste handler.
- Waste water on the other hand shall be managed on site through a waste water treatment plant. Storm water drainage system will consist of a network of inverted block drains, manholes and road gullies which will discharge to a suitable outfall.
- Cleaning: This will involve regular washing and cleaning of the pavements and other public areas. The proponent shall be responsible for this until the management company takes over.
- General maintenance and repairs: This will involve activities such as repair of building walls and floors, repair and maintenance of electrical gadgets and equipment, repairs of leaking water pipes, painting, maintenance of gardens, lawns and replacement of worn-out materials among others.

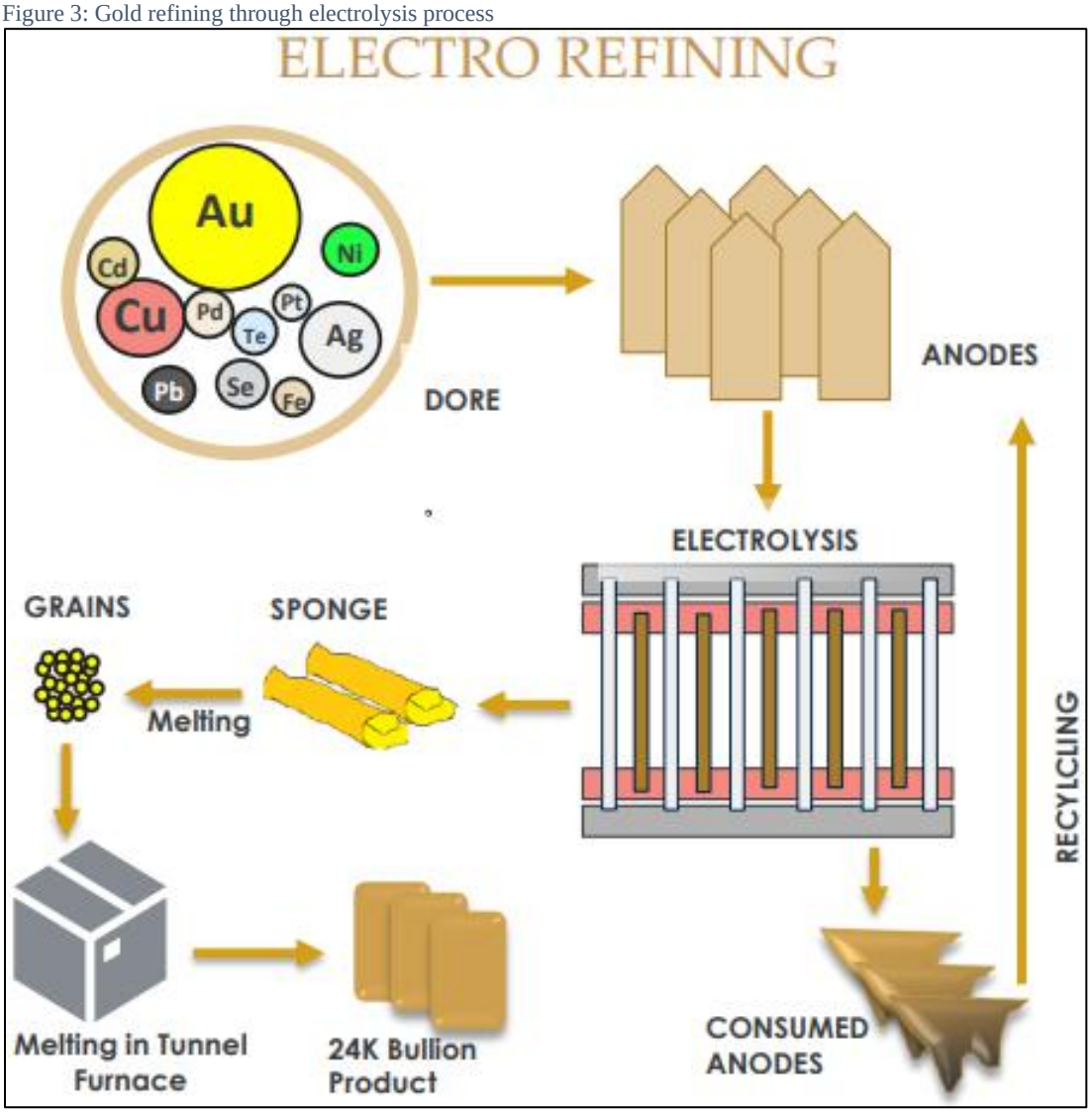
2.12.1 Gold Refining Process

After purchasing unpurified gold from miners, it is taken to the factory for refining. Refining of gold depends on the process it was extracted from the ore during mining.

Gold extracted by amalgamation or cyanidation contains a variety of impurities, including zinc, copper, silver, and iron. Two methods are commonly employed for purification: the Miller process and the Wohlwill process. The Miller process is based on the fact that virtually all the impurities present in gold combine with gaseous chlorine more readily than gold does at temperatures equal to or greater than the melting point of gold. The impure gold is therefore melted, and gaseous chlorine is blown into the resulting liquid. The impurities form chloride compounds that separate into a layer on the surface of the molten gold.

The Miller process is rapid and simple, but it produces gold of only about 99.5% purity. The Wohlwill process increases purity to about 99% by electrolysis. In this process, a casting of impure gold is lowered into an electrolyte solution of hydrochloric acid and gold chloride. Under the influence of an electric current, the casting functions as a positively charged electrode, or anode. The anode dissolves, and the impurities either pass into solution or report to the bottom of the electrorefining tank as an insoluble slime. The gold migrates under the influence of the electric field to a negatively charged electrode called the cathode, where it is restored to a highly pure metallic state.

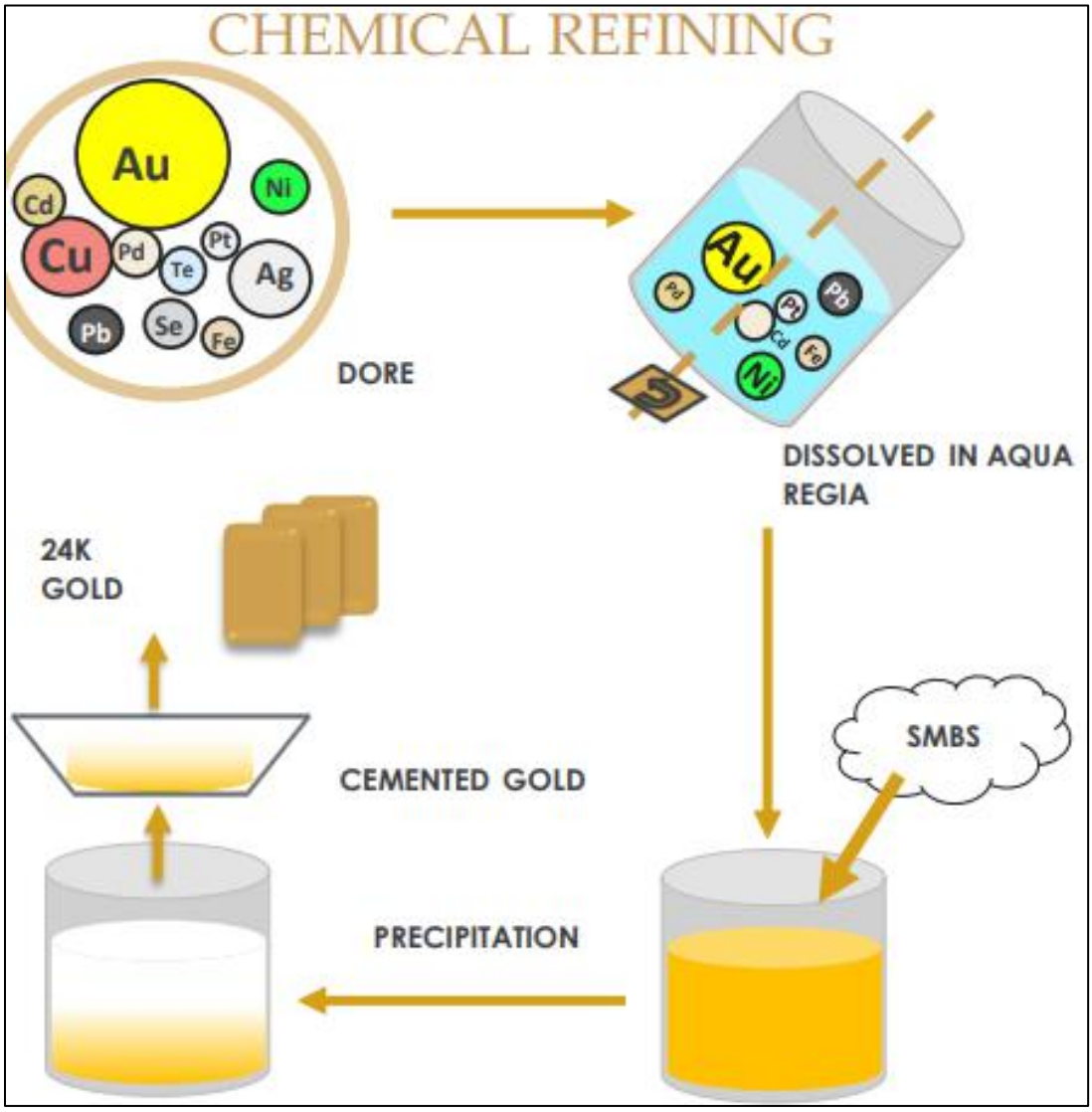
Figure 3: Gold refining through electrolysis process



Source: MMTC-PAMP London

Although the Wohlwill process produces gold of high purity, it requires the producer to keep on hand a substantial inventory of gold (mainly for the electrolyte), and this is very costly. Processes based on direct chemical purification and recovery from solution as elemental gold can greatly speed gold processing and virtually eliminate expensive in-process inventories.

Figure 4: Gold refining through chemical process



Source: MMTC-PAMP London

Refining from scrap

The processing of gold scrap varies not only with the gold content but also with the amenability of the gold in the scrap to extraction. Thus, the bulk of the gold may be recovered by leaching techniques using cyanidation or aqueous chlorination, and the residue may then be treated by smelting to recover the balance. Generally, scrap with a gold content of less than 0.1 percent,

unless readily recoverable by leaching, is recycled back to a pyrometallurgical process. Metallic scrap gold from jewellery production is frequently melted on-site and reused.

2.12.2 Solid Waste Management

Land pollution is most likely to be a concern during the operation phase. Solid waste generated if not properly managed may lead to environmental pollution and degradation. Main sources of waste will emanate from food and beverage outlets, packaging materials, shops, expired food products and general littering which might create public nuisance. These facilities will use the existing privately owned licensed companies to collect and dispose of wastes as per the provision of EMCA (Waste Regulation) 2006. Provision of appropriate waste receptacles/skips will be located strategically within the facility to enhance waste segregation and management.

The table below shows the various type of products, by products and waste that will be generated during the proposed project's cycle.

Table 3: Products, by-products and waste

Project Activities	**Material/Equipment to be used**	**Waste/ by products generated**	**Disposal method**
Planning and design phase-No anticipated activities or processes			
Construction phase			
Clearing the site	-Earth movers	-Rock debris -Noise (by earth movers)	-Soil to be used for backfilling -Wood would be used in construction of workers houses -Good maintenance of machines being used
Excavation/Earthworks including removal of topsoil	-Excavation equipment including caterpillars, hailers etc.	-Soil -Roots -Noise	-Soil to be used for backfilling and landscaping.
Transportation materials maintenance equipment	-Trucks -Fuel -Spare parts and lubricants oil	-Air fumes -Used oil and other lubricants	-Used oil/grease to be reused for lubricating movable parts of equipment
Human consumables	-Stationers -Computers -Photocopiers -Clothing materials -Vehicles -Medicines -Reagents -Food and water	-Used paper -Obsolete/spoilt clothing, computers, photocopiers and vehicle parts -Human waste -Expired drugs & reagents	-Sell waste paper to dealers -All obsolete should be carefully sorted, stored and sold to dealers -Septic tank should be provided in all the workman's camps & disposed of appropriately in designated sites
Manpower	Skilled and non-skilled workforce	Human waste	-Use of septic tank/pit latrines

Project Activities	Material/Equipment to be used	Waste/ by products generated	Disposal method
Construction materials	Natural gravel, sand, crushed stone aggregates, hard stone, cement, bitumen, pre-coated chippings, asphalt concrete, timber, bolts, galvanized iron, water, packaging materials, pipes (GI & PVC), Oil & grease storage containers, paints, kerosene	-Stone/rock debris -Piping remains -Plastic waste -Oil & greases spills -Waste water -Used containers	-Soil & rock debris would be used for landscaping & back filling the gullies -Timber splits would be used for firewood and burning tar -Plastic waste should be resold to waste collectors -Metallic wastes can be recycled or be sold to dealers -Waste water can be recycled by watering diversions to control dust -Oils & grease should be reused. Be sold to dealer
Post construction and operation phase			
Workmen's camps	-All associated building materials	Unusable materials e.g., broken timber, glass	-Should be removed & disposed in accordance with waste categories
Construction machinery	-All machines		-Should be sold to dealers or be used in another project
Refinery wastes, fumes and chemical processes	-cyanide or aqueous chlorine -hydrochloric acid and gold chloride. -Amalgam	-Mercury -Zinc -Copper Metals	-Mineral wastes to be purified for reuse in other sectors -Chemical wastes to be incinerated by licenced waste handler

2.12.2 Sewer System

The proposed project area is not served by public sewer; therefore, the proposed project shall be constructed with septic tank to manage sewage waste.

2.12.3 Storm Water Drainage

The topography of the development site is a general fall towards River Yala. Preliminary calculations and design have assumed that the entire development site will be permeable on the outdoor. The extent of soft landscaping will reduce the runoff volumes, but it is anticipated that these areas will be small approximately 2% maximum) of the development areas and therefore not significant in the storm water percolation.

CHAPTER 3: STUDY AREA BASELINE INFORMATION

3.1 Introduction

Baseline information is very important because it establishes the current biophysical conditions, and it is against these conditions that performance of environmental strategies will be evaluated. Baseline information is intended to establish the present state of the environment, considering changes resulting from natural events and from other human activities. The expected social and economic gains from the proposed project must be weighed in light of possible negative impacts on the environment and tenable measures that have been proposed to mitigate against such impacts. The baseline information for this proposed project was gathered from both secondary sources and the field visits described earlier in this report.

3.2 Location of the Proposed Project

The proposed Kakamega Gold Refinery is located on L.R NO: KAKAMEGA/IGUHU/2658 & 2659 at Lidambitsa in Kakamega South Sub-County, Kakamega County. The site can be accessed via Kakamega Kisumu Highway approximately 20km from Kakamega Town. The corresponding area coordinates are 0.158580 Sand 34.744834 E. Notable neighbouring facilities include River Yala bridge, Iguhu Hospital and Iguhu Police Station.

Kakamega County is located in the Western part of Kenya and borders Vihiga County to the South, Siaya County to the West, Bungoma and Trans Nzoia Counties to the North and Nandi and Uasin Gishu Counties to the East. The County covers an area of 3,051.3 Km2. Map 1 indicates the Position of Kakamega County on the Map of Kenya.

3.3 Physiographic and Natural Conditions

3.3.1 Physical and Topographic Features

The altitudes of the county ranges from 1,240 metres to 2,000 metres above sea level. The southern part of the county is hilly and is made up of rugged granites rising in places to 1,950 metres above sea level. The Nandi Escarpment forms a prominent feature on the county's eastern border, with its main scarp rising from the general elevation of 1,700 metres to 2,000 metres. There are also several hills in the county such as Misango, Imanga, Eregi, Butieri, Sikhokhochole, Mawe Tatu, Likhanda, Kiming'ini hills among others.

3.3.2 Ecological Conditions

There are two main ecological zones in the county namely, the Upper Medium (UM) and the Lower Medium (LM). The Upper Medium covers the Central and Northern parts of the county such as Ikolomani, Lurambi, Malava, Navakholo and Shinyalu that practise intensive maize, tea, beans and horticultural production mainly on small scale; and Lugari and Likuyani where large scale farming is practised. The second ecological zone, the Lower Medium (LM), covers a major portion of the southern part of the county which includes Butere, Khwisero, Mumias East, Mumias West and Matungu.

Ikolomani is where the proposed project is located which is under upper medium ecological zone. n this zone, the main economic activity is maize farming, sweet potatoes, tea, bananas, ground nuts and cassava production which is done under small scale basis.

Photo 7: A house and mixed cropped farm

Source: Field survey, 2025

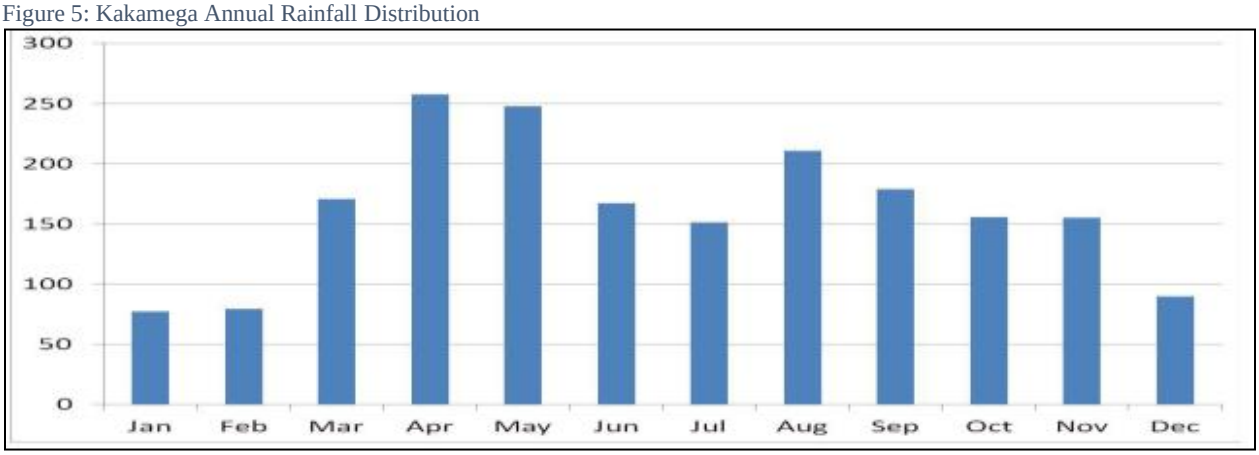
3.3.3 Climatic Conditions

The annual rainfall in the county ranges from 1280.1mm to 2214.1 mm per year. The rainfall pattern is evenly distributed all year round with March and July receiving heavy rains while December and February receive light rains. The temperatures range from 18^0C to 29^0C. January,

February and March are the hottest months with other months having relatively similar temperatures except for July and August which have relatively cold spells. The county has an average humidity of 67%. Since the early 1960s both minimum (night) and maximum (day) temperatures have been on a warming trend throughout Kenya. Current projections indicate increases in temperature.

Recent trends show a marked increase in inter-annual variability and distribution of rains, with an increase in the number of consecutive dry days and shorter but more intense periods of rainfall resulting in an increase in frequency of floods. Future climate change may lead to a change in the frequency or severity of such extreme weather events, potentially worsening impacts. Increased average temperatures and changes in annual and seasonal rainfall will be felt across key economic sectors, such as agricultural production, health status, water availability, energy use, infrastructure, biodiversity and ecosystem services (including forestry and tourism). Impacts are likely to have disproportionate effects on the poor as such groups have fewer resources to adapt to climatic change and vulnerability. Kakamega South Sub-county where the proposed project is located receives 1800mm to 2000mm of annual rainfall.

Figure 5: Kakamega Annual Rainfall Distribution



Source: Kenya Meteorological Department

3.3.4 Geology and Soils

The geology of the county is made of intrusive (mainly granites), Nyanzian volcanic and the Kavirondian sediments. However, the granites cover most parts of the area. Specifically, the sequence of rocks and sediments that characterize Kakamega county are of a geological structure of the Precambrian basement system formed in the Jurassic periods of Mesozoic era from the geological processes. These occurred during the middle and late cretaceous through the early

tertiary and Pleistocene periods. The basement system rocks mainly stretch to the east of the Nandi fault and they comprise extrusions of the acid to basic Nyanzian volcanic at high depths including basalts, andesitic tuffs, agglomerates and rhyolites overlain by highly thick series of coarse Kavirondian conglomerates, grits and finely banded mudstones stretching to the central parts. Nyanzian volcanics also present in the area includes granitized gneisses, augengneisses, migmatites and small portions of hornblende. The Nyanzian and Kavirondian sediments also comprise major intrusions of two granitic rock masses forming the Maragoli and Mumias Goldfields.

The outcrop of fine-gained to extremely coarse-grained tertiary phonolites, forming the only rock strata in the age category rests on a highly uneven surface in the south. The rock structure in the county owes its origin from the remedial volcanic activities and weak faulting that occurred during the formation of rift valley in the Pleistocene period. The soils form extensive deposits of black clays mainly along river valley, sandy soils, gravelly alluvium (with considerable yields of alluvial gold), lateritic ironstone capping, and black silt deposits along the streams. The large tracts of forest reserves mainly at the foot of the Nandi escarpment on the central and eastern parts are characterized by thick soils. Rock exposures are generally a common phenomenon in the county and especially in the streambeds excepts in the granite areas. They are also patched on the divides of the Nyanzian and Kavirondian rocks in the central.

The proposed project site is majorly dominated by red Loam soil as seen on the picture below.

Photo 8: Picture showing soil type on the project site

Source: Field survey, 2025

3.4 Administrative and Political Units

3.4.1 Administrative Sub-divisions

The County comprises of twelve Sub-counties, sixty wards, one hundred and eighty-seven Village Units and four hundred Community Areas. The twelve sub-Counties include; Likuyani, Lugari, Malava, Navakholo, Lurambi, Ikolomani, Shinyalu, Mumias East, Mumias West, Matungu, Butere and Khwisero.

Kakamega South sub-County in which the proposed project is located has an area of 143.6km2. A summary of area coverage is shown in the table below.

Table 4: Area by Sub-county and Ward

Mumias West Sub-County			
Ward	**Area Km²**	**No. of village units**	**No. of community areas**
Idakho North	40.6	3	7
Idakho Central	46.1	3	7
Idakho South	24	3	6
Idakho East	32.9	3	6
Total	143.6	12	26

Source: Kakamega CIDP 2023-2027

3.4.2 Political units

Kakamega County comprises of twelve constituencies with twelve elected Members of Parliament and sixty electoral wards with sixty elected Members of the County Assembly. The constituencies include Likuyani, Lugari, Malava, Navakholo, Lurambi, Ikolomani, Shinyalu, Mumias East, Mumias West, Matungu, Butere and Khwisero.

3.5 Demographic Features

3.5.1 Population size and composition

Table 5: Showing population and composition

Gender (C 2019)	
Males	897,133
Females	970,406
Intersex	40
Total	1,867,579

Source: National Population Census, 2019

3.5.2 Urban and rural population

Table 6: Population size representation in urban and rural areas

Urbanisation (C 2019)	
Rural	1,682,239
Urban	185,340

Source: National Population Census, 2019

3.5.3 Age groups

Table 7: Population size in age groups

Age groups (C 2019)	
0 – 14 years	786,681
15 – 64 years	994,955
65+ years	85,872

Source: National Population Census, 2019

3.5.4 Age distribution

Table 8: Population size in age distribution

Age distribution (C 2019)	
0 – 9 years	494,704
10 – 19 years	530,648
20 – 29 years	263,897
30 – 39 years	201,262
40 – 49 years	144,719
50 – 59 years	104,028
60 – 69 years	74,032
70 – 79 years	36,892
80+ years	17,326

Source: National Population Census, 2019

3.6 Infrastructure and Development

Infrastructure is an enabling environment for the county's socio-economic growth. The infrastructure facilities include road network, rail network, airports and airstrips, ICT, housing and water among others.

3.6.1 Rail, Road Network

Road Network: Kenya Vision 2030 recognises the need for seamless road network connectivity to spur economic growth through infrastructure development. Despite the progress made in accelerating economic growth, the County still exhibits poor road network in terms of road condition, road expansion and road linkages thereby hindering effective access to the market and reducing mobility of factors of production. In a bid to enhance road connectivity, the county government is committed to improving road network by tarmacking and gravelling of major roads and ensuring frequent maintenance of the roads.

The project site is well connected to Kakamega Kisumu Highway. The connection from other areas mainly gold mining sites has earth roads.

Photo 9: Picture of Kakamega-Kisumu Highway

Source: Field survey, 2025

Railway Network: Kakamega County has 35 km of railway line with two railway stations namely: Lugari and Butere. However, they are underutilized.

Airport and Airstrips: the county has two air strips, one in Kakamega and the other in Mumias. The strategic position of the county having proximity to the Kisumu and Eldoret International airports which are 60km and 120km respectively presents an opportunity for social and economic development.

3.6.2 Information, Communication and Technology

Information, Communication and Technology (ICT) is a major service enabler for Kakamega County development as well as a source of employment for the citizenry especially the youth. Masinde Muliro University of Science and Technology offers training in ICT related areas for Bachelors, and Post Graduate degrees in computer science and IT. Other various post-secondary education institutions are also offering diplomas and certificates courses in ICT e.g., Sigalagala Polytechnic and various technical institutions both public and private.

The Fibre Optic cable for Internet connectivity covers some areas in Kakamega County along the main tarmac road within Kakamega town. A few organizations and institutions along the main road leading and passing through Kakamega town are accessing this. Major ICT companies in Kenya like Safaricom, KDN, Telkom and Access Kenya are currently setting presence in Kakamega. Likewise, major media companies like Nation Media, Standard Group, MediaMax, and Royal Media for TV and radio stations are accessible from Kakamega. The county has MMUST FM radio station.

Mobile telephony in the county enjoys about 85% coverage in Kakamega County. The rapid pace of penetration of mobile telephony has led to provision of new products and services, as well as providing breakthrough in sectors such as Health, Agriculture, Education and access to finance. The network for the major service providers in the county such as Safaricom, Airtel, and Telkom are all within the county.

3.6.3 Energy Access

Wood is the main source of solid fuel for cooking in the county. According to the Kakamega Multiple Indicator Cluster Survey report 2013/14, 79.2 % of the county population use wood as their main source of energy, 1.1 % use LPG, 0.6 % use biogas, 13.8 % use charcoal and 1.2 % use grass/shrub while cooking as alternative sources of solid fuel.

The Kakamega Statistical Abstract (2015) indicates that a paltry 5.6 % of the county's population use electricity for cooking compared to the country's 22.7 % while a 92.4 % use paraffin for lighting compared to the Country's 69.5 %. In overall, 95.8 % of the household population in the county use solid fuels for cooking against a national figure of 82.5 %.

About 18% of the households have electricity (29 % urban and 6 % rural areas) and a total of 37 electric high masts lights in major trading centres such as Kakamega, Mumias urban areas have been erected.

Renewable energy is gaining prominence and is being used by some sectors in their solar powered projected. There is need for the prioritization of electricity reticulation and use of solar. This will reduce production costs and improve the livelihoods of the people.

Photo 10: Power cables serving electricity to Iguhu Hospital

Source: Field survey, 2025

3.7 Land Use

Agriculture is the dominant land uses in the whole county. However, the average land holding size in Kakamega County is 0.57 ha. Generally, the Southern and central regions have lower average land holding compared to the northern region.

The land has been sub-divided into small uneconomic portions in the southern and central regions due to the high population. There is need to encourage optimal use of land through diversification of economic activities and also reduce over reliance on land as the main and only source of livelihood.

The soil types in this locality are varied and ranges from red loam, sand to black cotton soil.

3.8 Biological Environment

3.8.1 Flora

The proposed project area is home to a variety of plants among them trees and several species of plants. These include eucalyptus, grevillea, *tithonia diversifolia* (Mexican sunflower), mango trees, guavas (*Psidium guajava*), African tulip tree (*spathodea*), Nile tulip (*markhamia lutea*) trees among others. See picture 20 below showing eucalyptus trees and *tithonia diversifolia* (Mexican sunflower) shrubs.

Photo 11: Trees and vegetation at Ivonda village

Source: Field survey, 2025

3.8.2 Fauna

The proposed project area is home to a number of wildlife ranging from a variety of species of birds, butterflies and other species of animals, these include birds, snakes, hares, monitor lizards and coloured butterflies among others. Birds observed in the project area include weaver birds, coucal birds, hadaba ibis, southern black tits among others.

3.9 Minerals and Mining Activities

Kakamega County has a huge mining potential of various mineral resources which are either underexploited or unsustainably exploited. With the adoption of the government's "Big Four agenda" the Ministry of Water, Environment and Natural Resources anticipated greater demand for construction materials resulting in interference of the natural environment through activities like mining and sand harvesting.

Surface gold mining activities have taken place in Kenya for many years up to the present time but most of the medium to large scale surface gold mining of gold and base metals took place during pre-independence days. The geographical survey and assessment of minerals revealed that the surface gold mining industry in Kenya is quite small. The endowment of mineral is varied.

However, surface gold mining is hampered by poor accessibility to deposits, legal set ups, financial and technical requirements, lack of markets and lack of large mineral deposits to warrant major capital investments. In terms of gold mining methods, some open cast surface gold mining happens where stones and quarries are mined which often leave holes that fill with water when it rains. Many lives have been lost in these collected waters. The other issue with respect to surface gold mining in Kenya is about community participation in making important decisions relating to the surface gold mining activity, for example, whether it ought to go on or not, relocation of people and their socio-economic and cultural activities (Institute for Law and Environmental Governance (ILEG), 2003).

The largest gold mine in the country was located in Rosterman near Kakamega town in Western region, operated from the 1930's till it was closed down in 1952. A medium scale copper mine was also operated at Malcalder in Migori areas of Nyanza region from 1956 until it closed in the late 1960's. Lead ore mines were operated in the Kinangoni and Vitengeni areas of Coast region till the 1970's (GoK, 2010).

The history of gold mining in Kakamega in Western Kenya dates back to 1892 when deposits of the precious metal was discovered along the Nyanza Rift Valley boundary. Kakamega town was began by a British company; Rosterman Gold Mines, which was incorporated and licensed in January 1935, to prospect and mine Gold. By 1952, it had mined 655,000 tons of ore and which had produced 259000 ounces of gold. By then it was one of the largest firms in western region (Machandaria 2011).

In later years, however surface gold mining in Kenya has been dominated by the production of a variety of industrial minerals, among which are Soda ash, fluorspar, diatomite, and limestone. Gold and gemstone production became the main activity of Small-Scale miners who have operated continuously in different parts of the country (GoK, 2010). In Kenya, Artisanal and Small-Scale gold mining is associated with rural areas especially the western part which is said to have potential for gold. These include Kakamega, Vihiga, Migori and Bondo areas (GoK, 2010).

After Rosterman Company limited ceased operations, the entrance to the main shaft remained sealed with a concrete slab to date, the mine fields were left in the hands of the local residents who have been cultivating and grazing animals. The other part of the land is occupied by Kakamega Vocational and Rehabilitation Center. Villagers still scavenge the abandoned mine field in search

of the elusive mineral. Experts believe that huge gold deposits remain embedded underneath the rocks in the region (Machandra, 2014).

Rosterman in Kakamega traces back its Artisanal and Small-Scale gold mining to the early 1980's. It had a prospecting license with around 100 registered members involved. The license was supposed to work up to 1992 and since then it was never renewed. The surface gold mining process then became a local dealers' management process. Since then to date there have been no clear records on the amount of gold mined within the entire location as well as its market availability (Okoth, 2008).

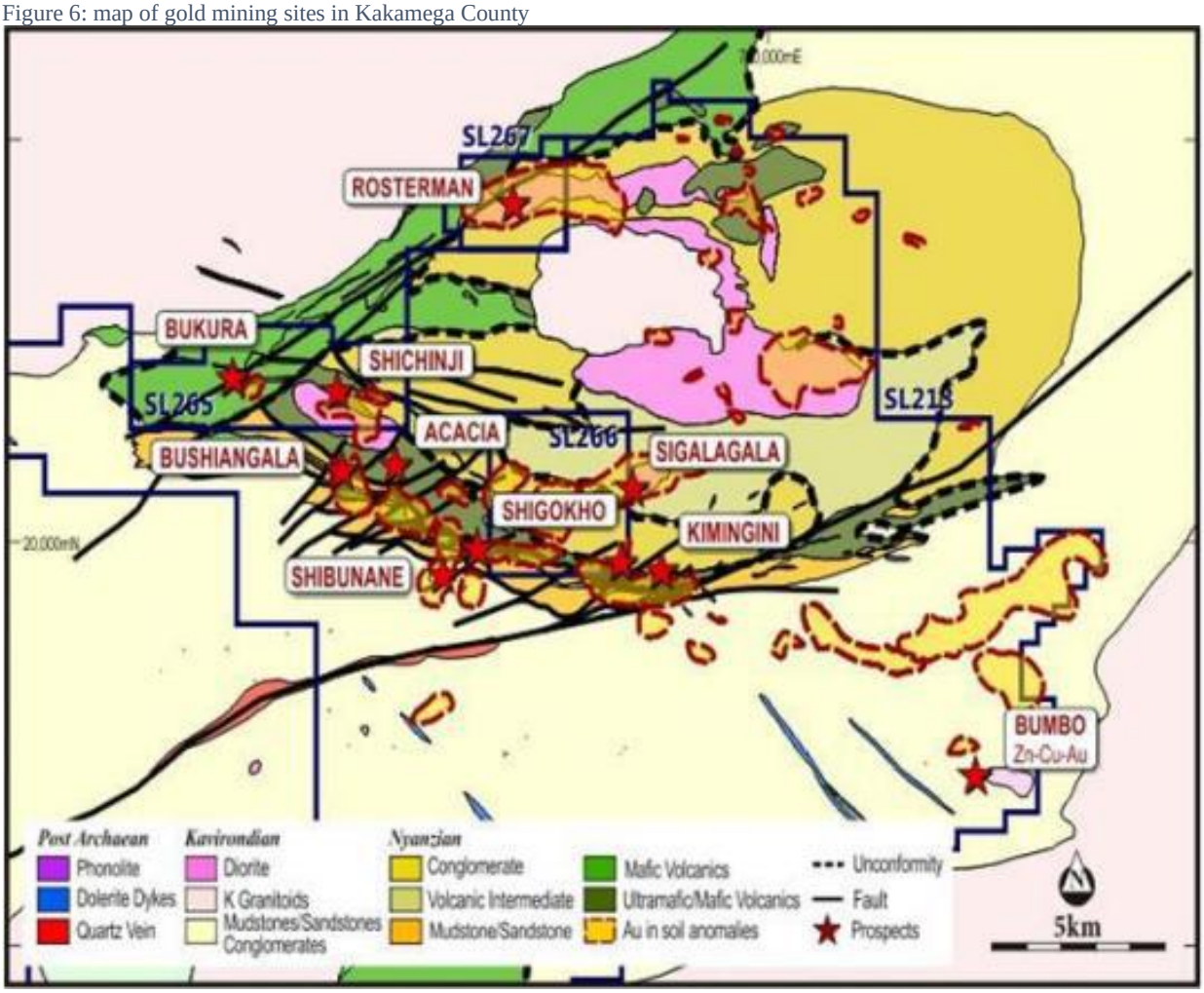
Nonetheless, underground artisanal gold mining can still be a significant employer, particularly to the people of Rosterman in Kakamega in Lurambi Sub-County, once the indirect impacts of job creation by suppliers to mining operations are considered. In addition to their core workforce, all mining operations have significant requirements for suppliers to provide goods and services, for example construction, logistics, raw materials, catering, maintenance, accountancy and legal services.

Rosterman mine has produced an estimated 250,000 ounces of gold at an average grade of approximately 13g/t Au. It yielded the highest amount of gold since gold mining began in the 1930s and 1940s. After 70 years since production ceased at Rosterman, there has been limited exploration in this highly prospective area until now. However, since this time drilling has confirmed the prospectively of this area, returning large ore grade intercepts. It is believed that the Kakamega Dome Camp has the potential for medium to large size, higher-grade gold deposits which has attracted some mining companies from other countries.

The proposed project area largely depends on gold mining for livelihood which is done by artisanal miners and small- scale mining.

The fig 6 below shows map of gold mining sites in Kakamega County

Figure 6: map of gold mining sites in Kakamega County



Source: Kakamega County CIDP

Photo 12: Artisanal gold miners extracting gold from ores

Source: Field survey, 2025

Photo 13: One of the abandoned gold mining site

Source: Field survey, 2025

3.10 Climate Change and Adaptations

3.10.1 Overview

The term “climate change” usually refers to changes that have been observed since the early 1900s. These changes in global climate are likely to be due to a combination of both natural and human causes: The main human influence on global climate is likely to be emissions of greenhouse gases (GHG) such as carbon dioxide (CO_2) and methane (CH_4).

Factors likely to lead to climate change due to the operation of the gold refinery include:

- Emissions of CO2 and other greenhouse gases as by-products of the diesel consumed in backup generators, the fuel used in deployed service vehicles and the refrigerant gases (fugitive emissions) associated with the air-conditioning systems in the buildings. The air conditioning systems normally use HCFCs (refrigerants)like; R-22, R-123, R124, R401A, R401B, R402A, R-403B, R-408A, R-409A,R-414B and R-416A.Some HFCs commonly used include; R134a, R404A, R-407C, R-410A, R-417A, R-422A, R-422B, R-422D, R-507, R-508B. The HCFCs have only about 10% of the ozone depleting potential as CFCs.
- Unfortunately HCFCs are Greenhouse gases which possess very high global warming potential than CO2 despite their very low atmospheric concentrations. The HFCs on the other hand do not contain any ozone depleting Chlorine, but have global warming potential, although lower than HCFCs. To avoid use and emissions of both hydro fluorocarbons (HFCs) and hydro chlorofluorocarbons (HCFCs), a variety of climate-friendly, energy efficient, safe and proven alternatives should be adopted by the proponent.

- Indirect emissions associated with the consumption of purchased electricity, improper garbage disposal (methane) and clearing and cutting of trees to construct refinery related projects.

Emissions from backup generators, fleet vehicles and other equipment are due to inefficient combustion systems and use of unclean fuels. These emissions include NOx (oxides of Nitrogen), SOx (oxides of Sulphur), Ozone (O_3), carbon monoxide and the notorious greenhouse gas Carbon dioxide.

These pollutants have different impacts on the stratosphere leading to climate change, acid rain and impacts on human health.

3.10.2 Green Development and Climate Change Abatement

As part of mitigating against factors contributing to climate change the company should involve incorporation of "green/clean development mechanism" in its components. This shall include use of locally available resources such as solar and wind to generate electricity, use energy saving bulbs, providing enclosures with adequate natural light, re-planting harvested trees with indigenous species among others.

The company/contractors should deploy project equipment and machinery that are designed to abate pollution and its impact on climate change, and this should be included as one of the selection criteria of company/contractor's assets. The key environmental management systems that should be considered when evaluating the company/contractor's equipment and machinery are:

- Age of vehicles, equipment's and machinery.
- Components and type of fluids used in the gadgets cooling systems.
- Combustion efficiency of the engines.
- Emission and noise abatements gadgets in the plants such as existence of water precipitator in the mixers and their efficiency, enclosed conveyor systems, enclosed transportation systems, installed silencers among other pollution abatement technologies
- Ability of machines to use or adjust to use clean flues such as biofuels, low Sulphur fuels, unleaded fuels among others

The above information should be supported with manufactures manuals devices, log books, inspections reports/certificates, calibration reports/certificates., Recommendation from previous clients among others

Such mitigation measures shall play a great role in reduction of greenhouse gases which are the major contributors to global warming/climate change.

3.10.3 Climate Change Mitigation

The Government of Kenya has taken several measures in addressing issues of climate change such as development of policy that take into consideration sustainable development and by ratifying several multilateral environmental agreements (MEAs) and protocols that address various aspects of the environment as discussed under chapter 5 of this report.

So far climate change has not been adequately mainstreamed or integrated in sector specific plans and strategies. But efforts have been initiated in some areas such as in the energy sector in regard to use of solar, biofuels, gas to replace wood among others there are still remaining implementation gaps of the identified strategies/processes.

Based on the carbon footprint of the construction sites which is determined by the emissions from backup generator, electricity purchase, fugitive emissions, vehicles and vegetation clearing among others, the proponent will be required to calculate their carbon footprint as 'Tonnes of carbon dioxide equivalent' (tCO2e), which is the standard for comparing different greenhouse gases 'relative to one unit of CO_2'.The company will be required to plant trees equivalent to the generated emissions during the entire projects life cycle to act as carbon sinks. This can be done in collaboration with the Kenya Forest Service who in collaboration with local communities undertakes forest management, afforestation and reforestation programmes to ensure the mitigation measures are effective. The proponent should work towards reducing carbon footprint by employing environmentally friendly and sustainable technology.

CHAPTER 4: RELEVANT POLICY, LEGAL AND REGULATORY FRAMEWORK

4.1 Chapter Overview

This chapter discusses the relevant national legal, regulatory and administrative framework. Also described herein are international safeguards, guidelines, policies and conventions that frame a sustainable approach to eco-development, including the approach towards the environmental and social impacts of the developments, and how they should be mitigated. Relevant legislation needs to be strictly adhered to for the successful implementation of the project, and throughout the lifetime of the project.

The legislations have been used to inform the development of this ESIA report and to ensure that adequate mitigation measures are put in place to deal with the negative impacts, and that all project related activities are in conformity with the existing laws, and regulations, and international best practices.

In addition, the proponent will be required to develop and implement (if these do not exist already) internal environmental and social policies and plans, including setting up of relevant institutional frameworks to oversee their fruition.

4.2 National Institutional Framework

4.2.1 Institutional Environmental Liaison Units

NEMA is linked to sectorial lead agencies, private organizations and educational institutions through their environmental liaison units. These institutions include county environment departments, parastatals, learning institutions, NGOs and CBOs among others and are charged with implementation of environmental programmes and integration of environmental concerns in sectorial policies, plans and programs. Consequently, they monitor investment programmes at their respective sectorial levels.

Relevance to the project

Relevant environmental liaison units are stakeholders in the proposed project and will have input into the ESIA study process. These include the State Department of Mining, Ministry of Lands (proponent in this case) and county environment department amongst others.

4.2.2 National Environment Management Authority

NEMA is established under section 7 of the Environmental Management and Co-Ordination Act, No. 8 of 1999 as the principal institution which exercises general supervision and co-ordination over all matters relating to the environment. It is also the principal instrument of Government in the implementation of all policies relating to the environment.

In specifics (and most relevant here) NEMA is charged with the responsibility to:

- Co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plans, programmes and projects with a view to ensuring the proper management and rational utilization of environmental resources on a sustainable yield basis for the improvement of the quality of human life in Kenya.
- Identify projects and programmes or types of projects and programmes, plans and policies for which environmental audit or environmental monitoring must be conducted under this Act.
- Monitor and assess activities, including activities being carried out by relevant lead agencies, in order to ensure that the environment is not degraded by such activities, environment is not degraded by such activities, environmental management objectives are adhered to and adequate early warning on impending environmental emergencies is given.
- Publish and disseminate manuals, codes or guidelines relating to environmental management and prevention or abatement of environmental degradation.

4.2.3 County and sub-County Environment Committees

County and sub-County Environmental Committees contribute to decentralization of activities undertaken by NEMA. This has enabled local communities to have greater access to environmental management information. It has also enabled the County and Sub- County Environment Committees to conduct quick site visits and review of reports of proposed projects.

4.2.4 National Environment Council

EMCA 1999 Part III Section 4 outlines the establishment of the National Environment Council (NEC). NEC is responsible for policy formulation and directions for purposes of EMCA, setting national goals and objectives and determining policies and priorities for the protection of the environment, and promoting co-operation among public departments, local authorities, private

sector, non-governmental organizations and such other organizations engaged in environmental protection programs.

4.2.5 Project Neighbourhood and Associations

The proposed gold refinery plant is likely to attract the interests of the area's neighbourhood association(s)/general public. Therefore, an extensive public participation process formed a major component of this study. From the foregoing, particular reference is made to Section 17 of the Environmental (Impact Assessment and Audit) Regulations, 2003, which states that: The Proponent shall in consultation with the authority seek the views of persons who may be affected by the project.

The above expression clearly underscores the concept of participatory environmental planning and management in the context of urban development.

4.2.6 Other Relevant Institutions

Table 9: Institutions with an Environment, Health and Safety Mandate

Institution	**Responsibility**
Provisional and District Environment Committees	Established under section 9 of EMCA, Provisional and District Environment Committees are responsible for the proper management of the environment within the province or district in respect of which they are appointed.
Water Resources Authority (WRA)	Regulates and protects water resources from adverse impacts Regulates water infrastructure, use and effluent discharge including abstraction.
Department of Occupational Health and Safety	It oversees provisions of health, safety and welfare of all workers in all workplaces, trains and does awareness on occupational safety and health, investigates occupational accidents at work places, does regular inspection and auditing of workplaces to promote best practices and ensure compliance with safety and health standards as set out in OSHA, 2007 and its subsidiary legislations and undertakes examination and testing of equipment such as hoists and cranes.

Institution	Responsibility
The Standards and Enforcement Review Committee (SERC)	EMCA also provides for the establishment of the Standards and Enforcement Review Committee (SERC). The committee is responsible for the enforcement of environmental quality standards that have been set by NEMA for various environmental parameters including noise and vibration control standards, water quality standards, waste management standards, among others. The SERC monitors the compliance level of committee of various projects through the Compliance and Enforcement Department of NEMA. The committee ensures pollution control standards are implemented and acts on public complaints on pollution.

4.3 National Policy Framework

4.3.1 The National Water Services Strategy, 2004

This strategy was prepared so as to ensure sustainable access to adequate and affordable water and sewage services to all Kenyans through rehabilitated and expanded water supply and sewage systems and through efficient, responsive institutions. It aims to increase the urban and rural water supply from current coverage, reduce the unaccounted-for water due to both technical and social losses and to increase the urban and rural water borne sewage collection, treatment and disposal coverage.

4.3.2 Vision 2030 and the Third Medium Term Plan 2018 – 2022

Kenya's Vision 2030 is the country's blueprint print planning strategy, while the Third Medium Term Plan (MTP III) acts as its accompanying implementation plan, for achieving economic, political and social transformation. The aim is to achieve 10% average growth per year to ensure a high-quality life for all citizens by the year 2030.

In this strategy document, political, economic and social transformation is envisaged to be achieved in various ways with special attention being paid to:

- Scaled up quantity and quality infrastructure: Vision 2030 notes that while significant gains in infrastructure development have been realized, Kenya's global competitiveness is still

weak. Infrastructure development and improvement more often have failed to keep at par with a growing human and vehicular population. Therefore, the strategy sets integrated, cost effective, safe and efficient world-class infrastructure facilities, networks and services as a necessary foundation and precondition for transforming the economy. The proposed projects will facilitate smooth and faster movement of goods, services and people, in turn giving the economy the boost it requires, and setting the foundation for transformation in support of Vision 2030.

- The prudent management of the country's natural resources and space: Under the social pillar, environmental management is one of the key eight sectors (others are Education and Training; Health; Water and Sanitation; Housing and Urbanisation; Gender, Youth, Sports and Culture), necessary for transformation of the economy. Specifically, the strategy recognises that environmental management is key to other sectors given Kenya's economy is dependent on natural resources. It therefore proposes promoting environmental conservation to better support the economic pillar's aspirations as well as improving pollution and waste management, among others.

4.3.3 Sessional Paper No. 10 of 2014 on the National Environment Policy 2014

The National Environment Policy (NEP) underscores the linkage between the environment and natural resources and the local and national economy, people's livelihoods and the provision of environmental services such as watershed protection and carbon sequestration. It therefore promotes an integrated approach towards the planning and sustainable use and management of Kenya's environment and natural resources so as to ensure better quality of life for Kenya's present and future generations. Specifically, it reiterates the constitutional right to a clean and healthy environment and imposes on the state the duty to safeguard and enhance the environment. However, it balances this with the right to development but with due consideration for sustainability, resource efficiency and economic, social and environmental needs.

In Chapter Six, it deals with emerging issues that require environmental stewardship. This includes infrastructural development, thus recognising that projects such as the proposed ones have distinct and unique effects on flora and fauna, social and psychological disruption, vegetation clearance, excavation works and spillages during construction. This thus requires that the proposed project

undergoes an Environmental and Social Impact Assessment. In addition, public participation in the planning and approval of the proposed project is mandatory.

The proposed project will be undertaken in compliance to this. This ESIA report acts as a first step in fulfilling NEP requirements while chapter 6 details the public participation process and results.

4.3.4 Kenya National Gender and Development Policy, 2000

The overall objective of the policy is to facilitate the mainstreaming of the needs and concerns of both men and women in national development. The Gender and Development Policy provides a framework for advancement of women's interests in resource allocation and utilization to ensure greater efficiency. The policy echoes the government's commitment to implementing the National Plan of Action which is anchored on the Beijing resolutions. The following are the areas targeted by the policy: Equality before the law-for Kenyan men and women as provided for in the Constitution and under the obligations of the Kenyan State in international law; Equal access to economic and employment opportunities- for both men and women in Kenya; Reducing gender disparity in political participation and decision-making; Sustainable Livelihoods - to remove obstacles to women's access to and control of productive assets, economic opportunities, and environmental resources; Education and Training - to enhance and sustain measures to eliminate gender disparities in access, retention, transition and performance in education for both boys and girls.

To achieve the highest attainable standard of health for both men and women by addressing gender disparities pertaining to access and use of basic health services and facilities; To increase the participation of women in the media and communications sector and promote gender sensitive portrayal of both men and women in the media; Empowering both men and women to be equal partners in development for an affirmative action to address gender disparities. With regard to the environment, the policy advocates for programmes that take into consideration issues that concern women, men, girls and boys. The policy acknowledges that certain environmental issues have specific relevance to women.

Relevance to the project

- Most job openings in the construction of the project are likely to be more suitable for men due to the nature of the works involving operating heavy machinery and equipment, tasks

requiring working at heights or in deep excavations such as quarrying and being absent from home for long hours. Social norms restrict women's sphere of activity, but they are also likely to benefit if the contractor employs a quota system that would oversee a certain number of women given employment.

- Women may also benefit from the influx of people in the area by engaging in small income generating activities.

4.3.5 The Kenya AIDS Strategic Framework II (KASF II) 2020/21 - 2024/25

The strategic framework provides the strategic directions that will lead to accelerated progress towards a Kenya free of HIV infections, stigma and AIDS related deaths. The Kenya AIDS Strategic Framework (II) provides guidance for implementing an evidence-based HIV response. It outlines priority interventions and emphasis on the need to create an enabling system to maximise on the impact of interventions. KASF II leverages the gains made under Kenya AIDS Strategic Framework I (KASF I) which was implemented through the County AIDS Strategic Plans (CASPs). It promotes the need to strengthen and bring to scale interventions and approaches that have yielded results. It is also premised on the Constitution of Kenya (2010) that stipulates the right to highest attainable standard of health to all citizens and guides the full engagement of counties in the national health response.

The framework builds on the gains made in the devolved system of planning and governance of the AIDS programmes in Kenya. It is aligned with the Kenya Universal Health Coverage agenda and its roadmap, Kenya's Vision 2030, the Kenya Health Sector Strategic Plan (KHSSP) of 2018/2019 - 2022/2023, as well as global and regional health commitments. The development of this framework has been informed by epidemic appraisals and the response. The framework has been developed during a period when the world is faced with global COVID-19 pandemic challenge and thus has taken COVID-19 related disruptions into consideration. It provides guidance on priority interventions for implementation.

KASF II Objectives:

- Reduce new HIV infections by 75%
- Reduce AIDS-related mortality by 50%
- Micro-eliminate viral hepatitis and reduce the incidence of sexually transmitted infections
- Reduce HIV related stigma and discrimination to less than 25%

- Increase domestic financing for the HIV response to 50%

Relevance to the project

- The Proponent recognizes that construction activities influence social behaviour in a manner that may perpetuate the spread of HIV/AIDs and many other Sexually Transmitted Infections (STIs). Budgetary allocation should be made to complement sensitization and management efforts of agencies dealing with HIV/AIDs and other STIs issues in the proposed project area.

4.3.6 The National Land Policy, 2009

The National Land Policy guides the country towards efficient, sustainable and equitable use of land for prosperity and posterity. The Mission of the Policy aims at: promoting positive land reforms for the improvement of the livelihoods of Kenyans through the establishment of accountable and transparent laws, institutions and systems dealing with land. The overall objective of the Policy is to secure rights over land and provide for sustainable growth, investment and the reduction of poverty in line with the Government's overall development objectives. Specifically the policy offers a framework of policies and laws designed to ensure the maintenance of a system of land administration and management that will provide: a) All citizens with the opportunity to access and beneficially occupy and use land; b) Economically viable, socially equitable and environmentally sustainable allocation and use of land; c) Efficient, effective and economical operation of land markets; d) Efficient and effective utilization of land and land-based resources; and e) Efficient and transparent land dispute resolution mechanisms. Sustainable land use practices are key to the provision of food security and attainment of food self-sufficiency.

4.3.7 Kakamega County Integrated Development Plan 2023-2027

The overall aim of the County Integrated Development Plan (CIDP) is to increase and expand sustainable development opportunities and build people's capacities to enable them create wealth and transform their lives for growth and prosperity in line with the Kenya's Vision 2030, Big Four Agenda and the Sustainable Development Goals.

4.3.8 United Nations Sustainable Development Goals

The Sustainable Development Goals (SDGs) were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people

enjoy peace and prosperity by 2030. The proposed project will meet SDG 9; industry, innovation and infrastructure.

4.4 National Legal Framework

There are a number of statutes in Kenya that relate to environmental concerns. Most of these statutes are sector-specific, covering issues such as public health, protected areas, air quality, soil erosion, endangered species, noise and vibration, water rights and water quality, cultural, historical, scientific and archaeological sites, land use, resettlement, among others.

Application of national statutes and regulations on environmental conservation suggest that the Proponent has a legal duty and responsibility to ensure that the proposed development does not compromise the rights of other to enjoy a clean and healthy environment. Some of the key laws governing the management of environmental resources in the country are hereby discussed however it is worth noting that wherever any of the laws contradict each other, the Environmental Management and Co-ordination Act 1999 prevails.

4.4.1 The Constitution of Kenya, 2010

Article 42 of the Constitution states that every person has the right to a clean and healthy environment, which includes the right: to have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69; and to have obligations relating to the environment fulfilled under Article 70.Article 69(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 (1) states that if a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.

Relevance to the project

- In an effort to comply with the constitutional requirements, the project Proponent commissioned this ESIA study.

- The Constitution requires the Proponent to uphold other people's rights and entitlements by putting in place measures to protect the environment throughout the project life (construction, operation and decommissioning phases).

4.4.2 Environmental Management and Coordination Act, 1999 Cap 387

The Environmental Management and Coordination Act, Cap 387 received assent on 6th January, 2000 and was gazetted on 14th January, 2000 and amended in year 2015. The Act correlatively entitles every person in Kenya to a clean and healthy environment meaning people are entitled by others, but they also have a responsibility of ensuring they do not undermine other people's enjoyment of the environment. The main objectives of the Act are to:

- Provide guidelines for the administration of an appropriate legal and institutional framework for the management of the environment in Kenya.
- Provide guidelines for environmental impact assessment, Environmental Audit and monitoring, environmental quality standards and environmental protection orders.
- The second schedule to the Act lists the projects for which an ESIA and EA must be carried out.
- Section 68 of the Act specifies that accurate records should be maintained, and annual reports submitted to NEMA as required.

Relevance to the project

- According to section 58 of the Act, an Environmental and Social Impact Assessment (ESIA) should be carried out on all projects specified in the second schedule of the act as likely to have a significant impact on the environment. This proposed project is considered to fall under the schedule.
- Part VII section 68 requires project Proponent to carry out annual environmental audits for submission to NEMA in order to determine the level of compliance with the EMMP. It is recommended that the project be subjected to statutory Environmental Audits.

4.4.3 EMCA Related Regulations

To provide guidelines on how to actualize EMCA and its amendment, the government has published a host of regulations. These provide specific requirements as related to water, air, waste, biodiversity and noise.

(a) The Environmental (Impact Assessment and Audit) Regulations, 2003 and (Amendment) Regulations, 2019

These Regulations, made under section 147 of the Environmental Management and Co-ordination Act (EMCA) Cap 387, contain rules relative to content and procedures of an environmental impact assessment. Part V - Environmental Audit and Monitoring - Environmental audit study (1) An environmental audit study shall be undertaken on the following development activities which are likely to have adverse environmental impacts:

- Ongoing projects commenced prior to the coming into force of these Regulations; or
- New projects undertaken after completion of an EIA study report.

As stipulated by the legal notice No. 101, 2003, PART V, Section 31 (3((a) (i) and (ii) it is required that an environmental audit be undertaken to provide environmental performance and compliance with regards to EMP. The amendment of 2019 categorises projects under medium/low risks, comprehensive and high risks which undergoes different stages of assessments by the authority.

Relevance to the project

The proponent therefore by engaging firm of expert to undertakes this project study report in fulfilment of the above requirements. This report conforms to the above requirements.

(b) EMCA (Water Quality) Regulations, 2024 (Legal Notice No. 177 of 2024)

The regulations provide for prevention of water pollution and protection of sources of water and apply to drinking water, water used for industrial purposes, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes.

They establish standards for wastewater management to ensure clean and healthy water resources and provision of standards for water for different uses.

Section 5. A waste generator shall collect, segregate and dispose the waste in the manner provided in regulation 6 of these Regulations..

Relevance to the project

The law requires both proponent and contractor to safe guard the water resource of the country through proper disposal of water, preventing pollution and sustainable water resource utilization.

(c) EMCA (Waste Management) Regulations, 2024 (Legal Notice No. 178 of 2024)

The regulation operates under the Environmental Management and Coordination Act to provide a framework for the management of waste and abatement of pollution guaranteed under Article 42 of the Constitution and statutory guarantees of ensuring clean, safe and sustainable environment for all people.

The regulations apply to the handling, storage, transportation, segregation and destruction of waste by providing for guidance, procedures and standards for environmental governance to ensure compliance in the waste management sector.

Relevance to the project

The law gives both contractor and proponent mandate to properly handle construction waste. There are institutions formed by the constitution of Kenya like NEMA and County Government that are mandated to licence waste disposal site and waste handler.

(d) The Sustainable Waste Management Act (Cap. 387c, Legal Notice No. 176) (Extended Producer Responsibility) Regulations, 2024

The objectives of this Act shall be to— (a) promote sustainable waste management; (b) improve the health of all Kenyans by ensuring a clean and healthy environment; (c) reduce air, land, fresh water and marine pollution; (d) promote and ensure the effective delivery of waste services; (e) create an enabling environment for employment in the green economy in waste management, recycling and recovery; (f) establish an environmentally sound infrastructure and system for sustainable waste management; (g) promote circular economy practices for green growth; (h) mainstream resource efficiency principles in sustainable consumption and production practices; and (i) inculcate responsible public behaviour on waste and12. Waste classification and segregation

The Act requires all waste producers to organise waste storage at the source through segregation off all non-hazardous waste in well labelled or colour coded bins.

Section 13 of the Act requires all producers to exercise extended producer responsibility obligations individually or collectively for sustainable waste management.

(e) EMCA (Noise and Excessive Vibration Pollution Control) Regulations, 2009

These were promulgated in May 2009, thus prohibiting any person or activity from making or causing any loud, unreasonable, unnecessary or unusual noise that annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. In determining whether noise is loud, unreasonable, unnecessary or unusual, factors such as time of the day, Proximity to residential area, whether the noise is recurrent, intermittent or constant, level and intensity of the noise, electronic or mechanical means etc. may be considered.

Several sections are relevant to construction:

- In rule 4, the regulation relates noise to vibration effects, which can be harmful to people or the environment. Harmful vibrations are defined as exceeding 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source.
- Rule 11 requires any person wishing to operate or repair any machinery, motor vehicle, or construction equipment which is likely to emit noise or excessive vibrations to carry out the activity or activities within the relevant levels provided in the First Schedule to these Regulations.
- Rule 14 requires that all motor vehicles operated on site should not produce any loud and unusual sound.
- Rule 14 requires that where construction, demolition, mining or quarrying is to be carried out in an area, the Authority may impose on how the work is to be carried out including the machinery that may be used, and the permitted levels of noise as stipulated in the Second and Third Schedules to these Regulations.

In this case permissible levels applicable to public utility construction should be in line with the table below.

Table 10: Second Schedule– Maximum Permissible Noise Levels for Construction Sites

Maximum Permissible Noise Levels for Construction Sites		
Facility	**Day**	**Night**
(a) Health facilities, educational institutions. Homes for	60	35
(b) Residential	60	35
(c) Areas other than those prescribed in (i) and (ii)	75	65

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

The proponent will ensure compliance to the regulations and where these may be exceeded, necessary measures must be undertaken to bring the noise levels within the set thresholds.

Relevance tom the project

Since the project implementation stage involves use of heavy machines which are noisy, the proponent and contractor are responsible to ensure staffs and local residents are not exposed to noise exceeding 85Db.

(f) EMCA (Air Quality) Regulations, 2024 (Legal Notice No. 180 of 2024)

The Regulations provide for prevention, control and abatement of air pollution to ensure clean and healthy air. They apply to internal combustion engines, premises, places, processes, operations or works to which the provisions of the EMCA and the Regulations made apply.

The regulation is a significant improvement of the 2014 Regulations and introduces various improvements including emission testing from mobile sources..

Relevance to the project

The proponent and contractor are responsible for any air pollution emanating from the proposed project implementation.

(g) EMCA (Management of Toxic and Hazardous Chemicals and Materials) Regulations, 2024 (Legal Notice 182 of 2024)

These Regulations are meant to ensure protection of human health and environment from adverse effects of toxic and hazardous industrial chemicals and materials and reduce risks posed by chemicals and provide for the sound management of chemicals. They also ensure the free movement of chemical products in compliance to (i) the Stockholm Convention; (ii) the Rotterdam Convention; (iii) the Minamata Convention; and (iv) any other relevant provisions of international treaties, agreements and conventions on the management of chemicals.

Relevance to the project

The proponent is required to regulate use of chemicals at the gold refinery since the procedure requires use of different type of chemicals with several categories of risks and hazards.

4.4.4 The Work Injury Benefits Act (WIBA), 2007

The WIBA Act provides for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes.

Section 7(a) of the Act, on the obligations of the employer, requires an employer to obtain and maintain an insurance policy with an insurer approved by the State in respect of any liability that the employer may incur under this Act to any of his employees.

Section 10(1) States that an employee who is involved in an accident resulting in the employee's disablement or death is subject to the provisions of this Act and entitled to the benefits provided for under this Act. It also states expressly that an employer is liable to pay compensation in accordance with the provisions of this Act to an employee injured while at work.

On First Aid covered in section 45(1), an employer is supposed to provide and maintain such appliances and services for the rendering of first aid to his employees in case of any accident as may be prescribed in any other written law in respect of the trade or business in which the employer is engaged.

4.4.5 Occupational Health and Safety Act 2007

The Occupational Safety and Health Act No.15 of 2007 and the Subsidiary Legislation makes provisions for the health, safety and welfare of persons employed. The provision requires that all practical measures possible be taken to protect persons employed from any injury. The provisions of the Act are also relevant to the management (including handling, transportation and disposal) of hazardous and non- hazardous wastes, which may arise at the project site.

It shall be the duty of the proponent to ensure workers safety is given priority during construction /improving of the roads. This should be achieved in several ways:

- As highlighted in Section 6, by undertaking risk assessments and adopting preventive and protective measures.
- The contractor is required to also develop a health and safety policy and bring this to the notice of all employees as per Section 7.
- Formation of Health and Safety committee at the workplace as stipulated in section 9.
- Ensure all dangerous situations and accidents are reported within time and appropriate action taken.

- Similarly, all plants and machinery in use shall be subjected to periodical examinations as provided by law to ensure safety according to Part VII.
- Proper handling, labelling and transportation of chemicals and hazardous wastes such as petroleum, fuels etc. Section 84 requires that material safety data sheets for chemicals and hazardous substances be availed at the workplace.

General welfare issues are dealt with under Part X. These include provision of drinking water, washing facilities, first aid and accommodation for clothing not worn during working hours.

The construction sites shall be registered as workplace with the directorate of occupational safety and health services under the Ministry of Labour, Social Security and Services as stipulated in Part V. A safety and health audit, fire audit, risk assessment, and safety and health audit have to be conducted for the site at least once every year. Failure to do so attracts a fine not exceeding five hundred thousand shillings or imprisonment for a term not exceeding six months or both.

The proponent will there undertake the necessary registrations, take all measures to ensure the health, safety and welfare of persons employed, as well as undertake the relevant assessments as outlined above.

In addition, several subsidiary legislations that operationalises the Act include:

(a) Safety and Health Committee Rules of 2004

These rules require the proponent and contractor (once they employ a more than twenty persons) to establish a committee to address the health, safety and welfare of workers. The Proponent and by extension the contractor, are required to provide space for meetings for the committee, training of the S&H Committee, appoint a S&H management representative, as well as allowing all staff to attend these meetings with no risk of loss of earnings, opportunities for promotion or advancement. They should also make legislation on occupational safety and health available to the Committee.

The proponent must also:

- Develop a clearly defined safety and health policy, bring it to the notice of all employees at the workplace, and send a copy of the policy to the director. They are also required to implement and review the policy when need arises.

- Organise annual health and safety audit of all operations related to the project. This can only be undertaken by a registered health and safety advisor who should forward such a report to the Director of Occupational Health and Safety Services.

(b) Noise Prevention and Control Rules, 2005

These rules have set minimum and maximum noise exposure limits beyond which workers and members of the public should not be exposed to without adequate means of protection. This is set at 90 dB(A) for more than 8 hours within any 24 hours duration and 140 dB(A) peak sound level at any given time.

The rules also have limits for exposure out of workplaces as 55 dB (A) during the day and 45 dB (A) during the night.

The rules have several recommendations on a comprehensive noise control program for workplaces that covers: noise measurement; education and training; engineering noise control; hearing protection; posting of notices in noisy areas; hearing tests; annual programme review

In addition, this should include a requirement for medical examination of workers who are exposed to noise (and compensation for impairment), regular noise monitoring and measurement, Information and training of workers, proper installation and maintenance of machinery to reduce noise emission, provision of hearing protection, or plant, and posting of notices where allowed levels are exceeded.

The rules have also set the minimum noise levels that should emanate from a facility to public/neighbouring areas by day or by night. The proponent should provide functional earmuffs for those operating the equipment/machineries that make noise.

(c) Medical Examination Rules, 2005

The rules offer a guide on the need and target of workers who have to undergo regular medical examination to identify the symptoms of hazardous exposures on the body. This is with a sole purpose of monitoring exposure for remedial action.

(d) The Occupational Safety and Health (First Aid in the Workplace) Regulations, 2024 (Legal Notice No. 79)

The regulations is meant to protect workers from eventualities by ensuring all workplace are equipped with first equipment and trained first aiders. Under the regulation no. requires the

occupier to (a) ensure that a first aid audit is carried out annually by a competent person; (b) provide information to all workers on procedures of first aid at the workplace, location of first aid kits and information on every person trained on first aid at the workplace; (c) provide and maintain such appliances and services for rendering first aid to his employees in case of any accidents and emergencies; (d) ensure effective emergency procedures are in place to manage and facilitate the transfer of a casualty to an appropriate health facility; (e) appoint in writing, adequate number of persons who shall administer first aid and be in charge of the first aid box or cupboard (f) ensure training for persons in charge of the first aid box or cupboard by first-aid training institutions approved by the Director; (g) ensure that the names and telephone numbers of persons in appointed under paragraph (e) are displayed conspicuously in the workplace at all the times; and (h) ensure all persons administering first aid services are vaccinated against highly infectious diseases including Hepatitis B.

(e) Fire Risk Reduction Rules, 2007

These rules were promulgated by the Minister for Labour on 16th April, 2007 and apply to all workplaces. The rules apply to this sector project in several ways as enumerated below.

Rule 16 requires a Proponent to ensure that electrical equipment is installed in accordance with the respective hazardous area classification system. It is also a requirement that all electrical equipment is inspected after six months by a competent person and the Proponent is required to keep records of such inspections.

Rules 29 - 31 refer to the installation and maintenance of firefighting systems in workplaces. Fire extinguishers are to be mounted at least 60cm above ground while a fire hose reel must be located within a radius of 30m.

Relevance to the project

The requires the contractor to comply to the above law by registering the construction site as a workplace with DOSHS, promoting health and safety of both workers and public.

4.4.6 The Public Health Act CAP 242

The Act makes provisions for securing and maintaining health. Part IX, section 115, of the Act prohibits any person or institution from causing nuisance or a condition likely to cause injury or which might be dangerous to human health.

In Part IX, section sanitation and housing requirements are set. These include maintaining cleanliness and ensuring facilities used by the project are suitable for human dwelling. This means that the proponent will be required to provide proper sanitary facilities and solid waste handling containers for use by the construction workers on site during construction phases. A licensed solid waste transporter will also be contracted to collect all solid waste from the site for dumping at approved sites and where possible waste for instance from excavation of the road surface can be recycled to the extent possible. As well, section 116 of the Act mandates the relevant departments of the County government to take proceedings at law against any person causing or responsible for the continuance of any nuisance or condition liable to be injurious or dangerous to human health.

Relevance to the project

The law gives the contractor and proponent to be responsible for public health by maintaining a clean working environment.

4.4.7 The Penal Code CAP 63

Chapter XVII on Nuisances and offences against health and convenience strictly prohibits the corruption of water in public springs or reservoirs, and the fouling of the atmosphere, making it noxious to the health of the public, including those living, passing or doing business in the area.

Waste disposal and other project related activities shall be carried out in such a manner as to conform to the provisions of the code. It is the responsibility of the contracted licensed waste handler to ensure that all kinds of wastes are disposed appropriately as per the legal provisions.

4.4.8 The Standards Act Cap 496

This Act promotes the standardization of the specification of commodities and provides for the standardization of commodities and codes of practice to ensure public health and safety. It establishes the Kenya Bureau of Standards (KEBS) and defines its functions as related to:

- Promotion of standardization in industry and commerce; and
- Provision of facilities for the testing and calibration of precision instruments, gauges and scientific apparatus, for the determination of their degree of accuracy by comparison with standards approved by the Minister on the recommendation of the Council, and for the issue of certificates in regard thereto.

This means that the Proponent have to ensure that all materials and equipment in use during construction/ upgrading as well as operation of the facility adheres to the highest standards and do not pose any human health and safety risk.

4.4.9 Employment Act CAP 226 and the Employment Act Subsidiary Legislation

The Employment Act defines the fundamental rights of employees, provides the basic conditions of employment of employees and regulates employment of children. The Act prohibits discrimination of any kind and requires promotion of equal opportunity in employment.

Part V and VI define the conditions of employment. For instance, in Part V, Section 32, the proponent and the contractor are required to provide a sufficient supply of wholesome water for employees on site. Some of these conditions are elaborated on in the subsidiary legislations. For instance, the Employment (Medical Treatment) Rules of 1977 require basic medicines such as Aspirin, Quinine (or some other recognized medicine for the treatment of malaria), Epsom salts and a solution of a recognized antiseptic) to be provided in sufficient quantity. Similarly, first aid kits should be available. The Employment (Sanitation) Rules of 1977 require sanitary services to be provided.

4.4.10 The Land Registration Act, 2012

This is an Act of Parliament that revises, consolidates and rationalizes the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes. The act requires that proper marking and maintenance of boundaries. An interested person who has made an application to the Registrar for his/her boundaries to be ascertained, the Registrar shall give notice to the owners and occupiers of the land adjoining the boundaries in question of the intention to ascertain and fix the boundaries. With regard to the maintenance of boundaries, the Act requires every proprietor of land to maintain in good order the fences, hedges, stones, pillars, beacons, walls and other features that demarcate the boundaries, pursuant to the requirements of any written law.

4.4.11 The County Governments Act 2012

This Act provides for county governments' powers, functions and responsibilities to deliver services and for connected purposes. It reiterates the role of the county government as to control air and noise pollution, and other public nuisances from activities within their jurisdiction. This is

necessary or desirable for the maintenance of the health, safety and well-being of the inhabitants of an area.

In addition, the Act covers matters of planning, placing the responsibility of planning within counties, and the development of various plans as outlined in Section 107 on the county government. This includes the County Integrated Development Plan (CIDP) and the County Spatial Plan (CSP).

Sections 114 and 115 deal with planning for nationally significant projects in a county. These require mandatory public hearing and public participation as well as provision of clear and unambiguous information through clear environmental impact assessment reports – a function to be observed through the public participation process planned under this EIA study.

4.4.12 The Physical and Land use Planning Act, Chapter 303

The act empowers National Physical and Land Use Planning Consultative Forum to promote effective co-ordination and integration of physical and land use development planning and sector planning; advise on the mobilization of adequate resources for the preparation and implementation of physical and land use development plans and strategies; and consider national security and advise on strategic physical and land use development projects of national, inter-county, county, or transnational importance.

The National Physical and Land Use Development Plan is the basis for— (a) environmental conservation, protection and improvement; (b) promoting social and economic development including national competitiveness; (c) promoting balanced national development; (d) optimal use of land and natural resources; (e) formulation of national physical and land use development planning policies; guiding inter-county, county and local planning; coordinating sectoral planning and development; managing human settlements; and providing a framework for guiding the location and development of strategic national investments and infrastructural development.

Relevance to the project

The act gives powers to the county government of Kakamega to control and plan for physical construction in the County. The project proponent shall be responsible for ensuring the plans are approved by physical planning department of Kakamega County.

4.4.13 Labour Relations Act, 2007

An Act of Parliament to consolidate the law relating to trade unions and trade disputes, to provide for the registration, regulation, management and democratisation of trade unions and employers organisations or federations, to promote sound labour relations through the protection and promotion of freedom of association, the encouragement of effective collective bargaining and promotion of orderly and expeditious dispute settlement, conducive to social justice and economic development and for connected purposes.

Part II of the Act states that; No person shall discriminate against an employee or any person seeking employment for exercising any right conferred in this Act.

4.4.14 Mining Act, 2016

The Mining Act is one of the principal laws governing mining in Kenya, along with the Constitution of Kenya. It was passed to modernize the legislative framework for mining, and to provide clarity on procedures, permits, and licenses. In part III under general principles it states that a person shall not search for, prospect or mine mineral, refine, mineral deposit or tailings in Kenya unless that person has been granted a permit or license in accordance with this Act. The Act states that the holder of a permit or license under this Act shall use the land in accordance with the terms of the permit or license and will ensure the following:

- Sustainable use of land through restoration of abandoned mines and quarries.
- The seepage of toxic waste into streams, rivers, lakes and wetlands is avoided.
- Disposal of any toxic waste is done in the approved areas only.
- Blasting and all works that cause massive vibration is properly carried out and muffled with the EMCA, 1999 (Cap. 387), Amendment 2015; and
- Upon completion of prospecting or mining, the land in question is restored to its original status or to an acceptable and reasonable condition as close as possible to its original state.

The act requires mineral rights holder to pay royalties to the government as follows:

- 70% to the National Government.
- 20% to the County Government; and
- 10% to the community where the mining.

Relevance to the project

The project manager shall obtain licence from the respective ministry before start of operation.

(a) The Mining (Licence and Permit) (Amendment) Regulations, 2023

The regulations were created to guide charges for licences, fees, rent and other charges regarding minerals, mining, prospecting, disposal and refining of minerals.

Relevance to the project

The regulation requires the project management to pay 1% of gross sales to the government as royalties.

4.4.15 Public Roads and Roads of Access Act Cap 399

The Public Roads and Roads of Access Act Cap.399 Act states that a public road is any road which the public has a right to use immediately before the commencement of this Act, or all proclaimed or reserved roads and thoroughfares being or existing on any land sold or leased or otherwise held under the East Africa Land Regulations, 1897, the Crown Lands Ordinance,1902, or the Government Lands Act at any time before the commencement of this Act and all roads and thoroughfares hereafter reserved for public use.

4.4.16 The Wayleaves Act, Cap 292

Section 3 of the Act states that the government may carry any works through, over or under any land whatsoever provided it shall not interfere with any existing building or structures of an ongoing activity. In the same breath, it indicates in Section 4 that one month notice will be given before carrying out any such works with full description of the intended works and targeted place for inspection. Any damages caused by the works would then be compensated to the owner as per this section. Further, Section 8 states that any person who without consent causes any building to be newly erected on a way leave, or cause hindrance along the way leave shall be guilty of an offence and any alteration will be done at his/her costs.

Relevance to the project

- The Proponent will be required to comply with the provisions of this Act.
- It was however noted during the site visits that there was no encroachment on the road reserve, thus, the construction work is anticipated to be undertaken seamlessly.

4.4.17 Traffic Act, Cap. 403

The Act empowers police designated to control traffic to stop vehicles and remove from the road those producing noxious emissions or to charge their owners in a court of law. Every motor vehicle is required to be constructed, maintained and used in a manner that ensures no avoidable smoke or visible vapour is emitted. The Traffic Act further requires that the vehicles shall only use the fuel specified in the vehicle licence.

The Traffic Act prohibits the operation of motor vehicles that emit black fumes that pollute the air and cause visibility problems. There is however no standard measure or definition of what constitutes black fumes or visibility problems. Additionally, the Act does not address specific pollutants that are particularly harmful.

Relevance to the project

- During the construction and operation phases, the proponent will be required to control vehicular pollution by avoiding to the best of their knowledge use of adulterated petroleum products and lead added fuels.

4.4.18 Water Act, Cap. 372

The Water Act 2016 replaced the Water Act 2002 and was affected so as to conform to the devolution structure of governance. The Act takes cognizance of the fact that provision of water services is a shared function between the National Government and the County Government. Under these Act several institutions have been established. These include the Water resources Authority which replaced the Water Resources Management Authority which had been established under the previous act water Act 2002. The objective of WRA is to protect, conserve, control and regulate use of water resources through the establishment of a national water resource strategy. In addition, the WRA is responsible for:

- Formulation and enforcement of standards, procedures and regulation for the management and use of water resources.
- Policy development.
- Planning and issuing of water abstraction permits.
- Setting and collecting permits and water use fees.

(a) Water Resource User Associations (WRUAs)

The act provides for establishment of WRUAs, which are community-based associations for collective management of water resources and resolution of conflicts concerning the use of water resources. The WRC may contract WRUAs as agents to perform certain duties in water resource management.

Water Works Development Agencies (WWDAs): The WWDAs are responsible for the following: (i) development, maintenance and management of national public works, (ii) Operation of the national public waterworks and provision of water services as a water service provider, until the responsibility for the operation and management of the waterworks is handed over to the county government, joint committee, (iii) Provision of technical services and capacity building to county governments and water service providers within its region.

Water Services Providers (WSPs): WSPs are now the responsibility of County Governments who have the mandate to provide water services. WSPs are responsible for provision of water services within the area specified in their licenses and development of county assets. Currently, WSBs sign service level agreements with WSPs and the regulator issues licenses to WSB. Under the new Water Act 2016, WSPs must apply again for new licenses to WASREB.

(b) Water Services Regulatory Board (WASREB)

The constitutionally guaranteed right to water and the need to protect consumers provides a strong basis for the national regulation and monitoring of water and sewerage services. This is critical to protect the interests and rights of consumers from exploitation and to set minimum national standards. As such, the functions of WASREB have been maintained in the 2016 act. WASREB holds the mandate to approve tariffs, monitor and enforce water services standards and issue licenses to Water Service Providers.

(c) Water Services Boards

As a result of sector reforms, responsibility for water and sanitation service provision has been devolved to eight regional Water Services Boards (WSBs): Athi (which serves the capital Nairobi), Coast, Tana, Lake Victoria North, Lake Victoria South, Northern, Rift Valley Water Services Board, and since 2008, Tanathi.

4.4.19 The Climate Change (Carbon Markets) Regulations, 2024

Kenya's Climate Change Act was passed in 2016 and amended in 2023. The Act aims to reduce greenhouse gas emissions and promote climate resilience. The act seeks to: Integrate climate change into development planning and decision making; Build resilience to climate change impacts; Enhance adaptive capacity to climate change impacts; Promote low carbon economic development.

Kenya has also developed National Climate Change Action Plan (NCCAP) III 2023-2027 as part of Nationally Determined Contribution (NDC) plan to reduce greenhouse gas emissions and adapt to climate change.

NDC goals are:

- Reduce emissions by 32% by 2030
- Transform to a low-carbon society
- Increase tree cover to at least 10% of the country's land area
- Achieve land degradation neutrality
- Use clean, efficient, and sustainable energy technologies

The NDC is implemented through the National Climate Change Action Plan (NCCAP). The NCCAP is a planning tool that aligns with the NDC and the Climate Change (Amendment) Act, 2023. The NDC is funded through a combination of domestic and international resources.

NDC sectors include: energy, land use, agriculture, waste management, transport, water and sanitation, health, and tourism.

4.5 International Conventions and Treaties

Kenya is party to a number of international conventions and treaties that are applicable to the proposed project. These international conventions and treaties include:

- International Worst Forms of Child Labour Convention, 1999 (No. 182) that requires states to eliminate the worst forms of child labour including that related to construction work such as quarrying, sand harvesting etc.
- Convention on Economic, Social and Cultural Rights, 1966 that safeguards labour rights and the right to work, and seeks to ensure just and favourable work conditions.

- Discrimination (Employment and Occupation) Convention, 1958 (No. 111) which seeks to eliminate exclusion from opportunities or treatment in employment or occupation on the basis of race, colour, sex, religion, political opinion, national extraction or social origin.
- Equal Remuneration Convention, 1951 (No. 100) which requires rates of remuneration to be established without discrimination on the basis of gender.
- Minimum Age Convention, 1973 (No. 138) which abolishes child labour.
- The Convention on Biological Diversity (CBD) 1990 is relevant to the proposed development as it will have an impact on plant and animal species. The Convention requires that projects should avoid disturbance of sensitive ecosystems.
- Workmen's Compensation (Accidents) Convention, 1925 (No. 17) which ensures that workers who suffer personal injury due to work related accidents, or their dependants, shall be compensated.
- The Vienna Convention for the Protection of the Ozone Layer
- The African Convention on the Conservation of Nature and Natural Resources (revised) signed in Maputo in 2003
- Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species.
- United Nations Convention to Combat Desertification (UNFCCC), 1994
- Convention concerning the protection of workers against occupational hazards in the working environment due to air pollution, noise and vibrations.

Relevance to the project

- The proposed works should be in tandem with national and international conventions that aims to safeguard the environment and natural resources.

CHAPTER 5: PUBLIC CONSULTATION AND DISCLOSURE

5.1 Overview

Public consultation and disclosure process particularly with local citizens affected by development proposals, is frequently construed as an integral aspect of successful decision making in the ESIA processes for major developments. As such, Public Participation is a policy requirement by the Government of Kenya and a mandatory procedure as stipulated in EMCA 1999, (amendment) 2015. Section 17 of the Environmental Regulations of 2003 (Impact Assessment and Audit) requires that all ESIA studies must incorporate Consultation and Public Participation (CPP).

It is an important process through which stakeholders including beneficiaries and members of public living in Kakamega County (both public and private), are given an opportunity to contribute to the overall project design by making recommendations and raising concerns about the proposed projects before they are implemented. In addition, the process creates a sense of responsibility, commitment and local ownership for smooth implementation. Stakeholder involvement and public consultation about the proposed Kakamega Gold Refinery was carried out on the project site at Ivonda Location and FGDs at Gold mining sites. The meeting and FGDs were conducted in order to capture the key concerns of stakeholders. The Stakeholder Engagements were done in order to foster better mutual understanding, address concerns and incorporate opinions to this report.

Views from the local residents, local leaders, surrounding institutions and development partners for the proposed Kakamega Gold Refinery, who in one way or another would be affected or have interest in the proposed project were sought through interviews and public meetings as stipulated in the Environment Management and Coordination Act, 1999 and its amendment Act 2015.

The aim of consultation and public participation is for.

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

Public participation was guided by the following objectives:

- To inform stakeholders about the proposed project with special reference to its key components and location.
- Create awareness among the public on the need for the ESIA for the proposed projects and similar development projects.
- To improve and increase transparency as well as public confidence in ESIA Study.
- To identify the social, bio-physical, economic and environmental concerns as perceived by stakeholders and the general public.
- To share with stakeholders, the impacts (positive and negative) that they should expect from the proposed project during construction and operation.
- To obtain local inputs into project designs, alternatives and mitigation measures of negative impacts of any nature.
- To collect stakeholders' views, comments, concerns and local knowledge regarding the proposed project.
- To incorporate the information collected in the ESIA study.

5.2 Approach to Consultation and Public Participation

The Public consultation process involved reconnaissance visits i.e., visiting the project area and its environs and also where the scoping exercises were carried out. Project stakeholders were identified and consulted with the aim of informing them about the proposed project and the public meetings to be held later. The consultant also collected their views on anticipated positive and/or negative impacts, get recommendations on how the adverse impacts can be mitigated or avoided, and gather local knowledge that would be useful to the proposed project.

The consultants employed various methods to ensure public consultation. These shall include focus group discussions (FGDs), administration of community questionnaires and holding of key stakeholders' representative meetings.

5.3 Engagement Methodology

To complete the public consultation exercise, a systematic approach was implemented that consisted of a reconnaissance visit to the project area, review of relevant documentation, conducting interviews, administration of questionnaires to the project stakeholders and holding stakeholders' meetings. During the first visits, the consultant engaged a number of key stakeholders in preparation for the public consultation process.

- Reconnaissance visits: Project site reconnaissance visits were carried out on 4th and 5th February 2025 to familiarize with the project area and scope. During these visits, would-be project stakeholders covering government institutions, administration offices, individual households and the neighbouring communities were identified.
- Literature review: A review of relevant information including the project's design report was done to provide a background on the project and area, and a basis for collection of additional information to fill identified gaps.
- Stakeholder identification and analysis: Like in all civil works projects, the core stakeholders comprise of people to be directly served by the project once implemented. This is the group that is likely to benefit or be affected by the proposed development hence the primary stakeholders. The ESMMP also identified a second category of stakeholders comprised of government officers, county government heads and institutions in charge of diverse sectors. This category was also consulted as key informants on sectoral policy and to advise this study on mitigation measures to be put in place so as to minimize adverse impacts in respective sectors. Each category of stakeholder called for a different approach to consultation, as discussed in section 5.5, 5.6, and 5.7 below.

5.4 Project Stakeholders

Here we defined project stakeholders as individuals, groups, or organizations, who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome resulting from the proposed project. Identification and analysis of stakeholders formed the basis for planning and designing of stakeholder engagement activities.

The stakeholders were identified on the basis of:

- Their interest in the project; found in area to be affected (directly or indirectly).
- Have mandate over various issues related to the project and general matters that link to the project e.g., County government, planning and technical design issues concerning the project.
- Their power and measure of influence over the proposed project.
- Those that are considered vulnerable within the proposed project area; their needs and considerations should be prioritised due to vulnerability.

Stakeholders are grouped as either public (including political wing), private or civil society. A database of all individuals, communities, interested parties, organizations and institutions will be

generated (and continually updated). Stakeholder identification is also based on three different levels (local, county, and national).

Among the key stakeholders consulted and invited for the public meetings included but not limited to:

- Deputy County Commissioner (DCC)
- Assistant County Commissioners (ACC)
- Water and Resources Authority (WRA)
- Ward and Sub-County administrators
- Community administrators
- Local Administrators including chiefs and assistant chiefs
- County Government of Kakamega through Department of Environment, water Natural resources and climate change
- Area Member of Parliament (MP)
- Area Member of County Assemblies (MCAs)
- Youth representatives
- Representatives of faith-based organisations (FBOs)
- Public Health Officials and stakeholders
- Representatives of artisanal miners
- Community members

Photo 14: Pinned sample public notice for meeting invitation

Knowbility CONSULTING LIMITED

Ministry of Mining, Blue Economy and Maritime Affairs

13/02/2025

TO

Hon. Silas Siyenji Muyeya

Idaho East Ward

Kakamega County

RECEIVED BY HON. SILAS SHIYENJI MEMBER OF COUNTY ASSEMBLY KAKAMEGA COUNTY IDAKHO EAST WARD P.O. Box 114-50106 KHAYEGA 17TH FEB 2025

RE: INVITATION TO A PUBLIC PARTICIPATION FORUM FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDIES FOR THE PROPOSED CONSTRUCTION OF GOLD REFINERY ON TITLE NO: KAKAMEGA/IGUHU/2658 & 2659 AT LIDAMBITSA IN IKOLOMANI SUB-COUNTY, KAKAMEGA COUNTY.

The above subject refer.

Knowbility Consulting Limited was Contracted by Concise Projects Limited (Project Sub-Contractor for Gold Refinery) Under The State Department of Mining-Ministry of Mining, Blue Economy and Maritime Affairs to conduct an Environmental and Social Impact Assessment for the proposed Gold Refinery.

Pursuant to legal notice no. 32 of the Environmental Management and Coordination Act (Impact Assessment and Audit) amendment (2019) and subsequent rules and regulations regarding public participation, we are pleased to invite you to a public consultation meeting on the above referenced project as part of the Environmental and Social Impact Assessment process. The objective of the meeting will be to inform and seek participation of the public on the proposed Gold Refinery Project.

The Public consultation meeting has been scheduled as follows;

Date	Venue	Time	Location
Friday 21st February, 2025	Construction Site-Opposite Iguhu Police Station	10:00am – 12:30 p.m	Lidambitsa-Ikolomani

Your presence and participation will be highly appreciated.

Sincerely,

Abraham Kuloba

Managing Director Knowbility Consulting Limited

KNOWBILITY CONSULTING LIMITED P. O. Box 18180 - 00100, NAIROBI Tel: +254 726 653 286

Knowbility CONSULTING LIMITED

Ministry of Mining, Blue Economy and Maritime Affairs

13/02/2025

TO

Hon/Prof/Dr./Mr./Mrs/Rev/Miss: .....

DCC KAKAMEGA SOUTH SUB-COUNTY

RECEIVED 17 FEB 2025

17/02/2025

RE: INVITATION TO A PUBLIC PARTICIPATION FORUM FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDIES FOR THE PROPOSED CONSTRUCTION OF GOLD REFINERY ON TITLE NO: KAKAMEGA/IGUHU/2658 & 2659 AT LIDAMBITSA IN IKOLOMANI SUB-COUNTY, KAKAMEGA COUNTY.

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Your presence and participation will be highly appreciated.

Sincerely,

Abraham Kuloba

Managing Director Knowbility Consulting Limited

KNOWBILITY CONSULTING LIMITED P. O. Box 18180 - 00100, NAIROBI Tel: +254 726 653 286

Photo 15: Sample stakeholder meeting invitation letters

5.5 In-Person Interviews

In-person interviews were used to get responses from the key stakeholders among them; area and regional administration including the Deputy County Commissioner (DCC) for Kakamega South sub-County where the project is being developed. Also, the Assistant County Commissioners (ACC) for Ikolomani South and Iguhu Police station OCS were also informed and interviewed about the proposed project. Project engineers were also informed on the ESIA study. The discussions ranged from the proposed project designs, waste management, alternative technology and sites, among other related issues.

The DCC, ACC, Artisanal Miners Committee (AMC) and Local administrators including the chiefs presented the following views concerning the proposed development.

(a) Kakamega South Deputy County Commissioner Mr. Mayama welcomed the project as a break through to locals of Kakamega County especially the mining areas. He emphasized importance of the project in job creation, development and improvement of livelihoods.

Photo 16: Interviews with administrators and Security Personnel

Source: Field survey, 2025

(b) The Assistant County Commissioner Mrs Ambogo acknowledged the project as a game changer for being the first in Kenya and in her area of work. She urged to support the project and requested the proponent to ensure locals benefit maximumly through job creation and civic education.

(c) The area assistant Chief Mr. Edwin Ngaira requested the proponent to carry out civic education on same mining procedures to reduce cases of deaths in mining shafts.

(d) The Artisanal Miners Committee (AMC) Chairman Mr. Makhule asked the development to be sustainable to the environment especially R. Yala which is to the project site and highly affected by Artisanal miners using mercury for mining activities. He requested the project developers to come up with sustainable technology both in mining and refining process to reduce environmental pollution, health risks and safe guard aquatic life. Makhule reiterated the need to have artisanal miners' union cooperatives to be involved in future engagements especially community-based benefit like CSRs.

5.6 Public Participation Meeting

In this project, public consultation meetings were conducted involving members of the community and project affected persons (PAPs) at Ivonda village in Kakamega South sub-County. The

approach adopted included, public meetings (Key stakeholders and *barazas*) and administration of questionnaires.

The public participation process took form of public and community meetings, which were divided into two (meetings) and Focus Group Discussion (FGD). The first community meeting was held on February 21, 2025 at Ivonda village at the proposed project site. The first meeting comprised a total of 44 attendees, among them:

1. Security officers represented by Iguhu Police Station OCS (Officer in Charge of Station)
2. Area leadership including chiefs and assistant chiefs
3. Representatives from the County Government of Kakamega among others.

The second public participation on February 21, 2025 took the form of a Focus Group Discussion (FGD) which was conducted at Ivonda village next to one of the mining site (gold). This FGD included leaders as listed below (a*lso see attached appendix for FGD*):

1. Assistant County Commissioner
2. Deputy County Commissioner
3. Persons with disability (PWD)
4. Public Health Officer (PHO)

The third public participation engagement/process on February 28, 2025 took form of a key stakeholder engagement (community meeting) at Lidambitsa village. This third public participation meeting comprised a total of 22 attendees, among them including community leaders among others. (*see appendices*).

Here is a summary of the comments and issues raised during these meetings:

5.6.1 Positive Comments made by Stakeholders

The following section provides details on the positive impacts of the proposed project as expressed by the stakeholders who interviewed:

- Creation of Employment Opportunities: Participants in the public meetings were optimistic that the project will create numerous employment opportunities for skilled and unskilled labourers alike during the construction and operational phases. Despite the fact that most of the project will need skilled labour force during construction, people expressed hope that they will be able to access employment once the project commences mostly as casual workers.

- Increased Business Opportunities: In addition to employment opportunities, majority of the participants were also optimistic that there will be an increase in business opportunities during the construction and operation of the gold refinery plant. Small scale business people such as food vendors and mobile money agents/outlets and kiosks will benefit greatly during construction. The project will lead to the expansion of various businesses and emergence of market centre near the site. There is in particular high possibility of expansion of fuel stations, hotels and restaurants, bars, etc. due to increased number of motor vehicles (and people) in the area.
- Growth of Towns and Shopping Centres: The locals were confident that the project will attract several workers who will need to stay around and therefore develop the area in terms of housing, social amenities infrastructure and markets
- Transfer of Skills: The members of the public suggested that with the refinery being a source of employment. Many different skilled workers will be employed from within and outside the area. This will lead to a transfer of skills and gaining of experience during the construction period. The regional mining representative Mr. Too explained to locals that it is a requirement by the law for the mining proponent to employ and train locals to work in the project.
- Increased earnings: The members of community were informed that the proposed project shall purchase gold directly from artisanal miners and eliminated the brokers therefore earning them more on their products.
- Improved security in the area- Since the project involves construction of a police post within the site and improvement of Iguhu police post through CSR; the security will improve greatly in the area.

5.6.2 Negative Concerns of the Community and Stakeholders

- Dust Generation: The public expressed concerns over possibility of generation of large amounts of dust at the project site and surrounding areas as a result of excavation works and transportation of building materials. The proponent will thus need to ensure that dust levels at the site are minimised as much as possible through sprinkling water in areas being excavated and on the access roads and diversions used by the transport trucks within the site. Additional mitigation measures presented in this report will need to be fully implemented to minimise the impacts of dust generation.

- Excessive Vibration and Noise Pollution: There was concern over the possibility of high noise and vibration levels at the project site as a result of excavation, and construction works. The source of noise pollution will include, transport vehicles, construction machinery, metal grinding and cutting equipment, among others. Excavations will also cause vibrations. However, the proponent will take appropriate steps to minimise noise pollution through provision of appropriate PPEs to construction workers, planning and minimising the frequency of transporting construction materials and ensuring that all construction machinery and equipment are well maintained. The public also proposed the construction works be undertaken during the day.
- Over dependence on mining income: Most residents were worried the project will make most residents over depend on gold mining which will undermine other sources of income like farming and eventually become a disaster when gold depletes. Mr. Makhule said the Ministry f mining should carry out civic education on the importance of diversification of income or livelihood.
- Abandoned mines being a death trap: The residents expressed concern over old, abandoned mines which of late has let to death of many artisanal miners who are tempted to enter the mines without safety gears and precaution leading to asphyxia. The State Mining department addressed the issues as they are following up with the old mines and come up with proper solution over the issues. Mr. Too said hence ford all mining site shall apply for NEMA licences and proper decommissioning plan employed on old mines. He said all tailings should not leave the mining sites as they shall be reused in rehabilitation.
- Child Labour: Members of the community were concerned about parents using their school going children to work on gold mines at the expense school. The area Assistant County Commissioner asked the community to report such cases to her so that legal steps can be taken against them. She encouraged the community to allow children undertake their studies which will benefit them in the future.
- Cases of water pollution and poor handling of mining chemicals like mercury: The Gold refinery will greatly influence many people to join ASGM which mostly uses mercury for leaching the gold from the ore. Mr. Makhule expressed concern of many cases of water pollution from mercury which affects aquatic animals and endangers mines from health complications. Residents also were concerned about the chemicals to be used to refine gold if

they are mishandled. Mr. Too assured the residents that civic education shall be done on proper handling of mercury. He however also said the ministry is testing on newer safer mining technologies.

Photo 17: Representative of the State Deopartment of Mining making his comments

- Discrimination in Employment Opportunities: The community requested the contractor to ensure locals get employed and that every segment of the refinery. They also urged the contractor to ensure those employed are interested in the job and meet the minimum requirements including age (18 years and older), gender balance, honest and integrity. They suggested the contractor to engage the local administrators during the recruitment exercises to ensure those recruited meet these minimum requirements.
- Lack of skills and knowledge for employment: The community was concerned about the project employing locals when they don't have the expertise or relevant skills to handle jobs within the project site during operation. Mr. Too representing the State Department of Mining said there are many jobs that locals will handle. They include non-skilled and skilled ones. He said the proponent shall employ and train about 70% of man power from the area as required by the law. He also urged local community especially youths to embrace faculties that relate to mining and refinery of minerals.
- Security Issues: Security concerns were raised as a result of construction of the refinery which shall purchase gold directly from people therefore criminals will be aware they have money and rob or steal from them. Hilda, representative of contractor assured the locals that security

camp will be constructed within the project site. Also, locals will not be paid in cash for their gold sold at the premise.

Photo 18: Area administrators making introductions and addressing the meeting

5.7 Summary of the Findings

The following suggestions were made during the consultations and in-home interviews: -

- The welfare and comfort of the community and neighbours should be considered seriously by the developer.
- The contractor should consider employing locals as casuals during construction and operation activities.
- The environment and health of the public should be protected from degradation.
- Corporate Social Responsibility (CSR) including using soils/spoils to landscape schools, watering points and access roads.
- Residents should be allowed to form CSR committees to manage all proposed CSRs by the proponent.
- Public consultation should be continuous throughout the project.

Photo 19: Proceeding of the public meeting

5.8 Focus Group Discussions

The Focus Group Discussions (FGDs) was conducted on February 21, 2025 at Ivonda village involving members of the Mining Community. FGD was conducted to gather people's opinions, ideas, and beliefs about the proposed Kakamega Gold Refinery. Also, in addition to questionnaires and public meetings, an FGD was conducted to capture what a people and feel freely. Responses in an FGD were open ended, broad, and qualitative in nature. They also provided and enabled the consultant/researcher to get more depth and get closer to what people were really thinking and feeling even though some of their responses were harder or even impossible to record on a scale. The main purpose of focus group research was to draw upon respondents' attitudes, feelings, beliefs, experiences and reactions in a way where other methods were not applicable.

An FGD also allowed the consultant to gather additional and more information in a shorter period of time, which took 45 minutes.

The FGD findings wan analysed in different degrees of depth, following these three levels of analysis, which ranges from less in-depth to more in-depth.

- Description: involved simple reporting of what the participants said based on the field notes and observations.

- Interpretation: it involved giving explanations and attaching meaning to what was described. This ensured a more in-depth analysis where meaning was attached to different statements given by participants.
- Recommendation: these involved suggestions of actions to be taken based on the consultant's interpretation of the FGD results.

Participants in the FGD acknowledged understanding the proposed development. The information about the proposed development was spread by the area MP, area MCAs, religious leaders in churches and through friends.

It was described that the residents want the proposed development to be implemented quickly and urge the responsible authority to ensure it does not stall. It was discussed that the contractor should start by giving miners skills and technologies of mining.

It was interpreted that participants have information about the proposed development but have no faith in local leaders acting as liaisons in the recruitment exercises. There was a proposal to have individual applicants interviewed to avoid discrimination based on clan, family status and personal vendetta. The discussion also illustrated the need to make equitable distribution of employment opportunities, for instance a proposal to have locals trained to work in the plant. (See annex for the FGD guide used).

Photo 20: An FGD with artisanal miners at Ivonda village

Source: Field survey, 2025

5.9 Number of Participants

This section highlights the number of participants in the two public consultation meetings and an FGD.

Table 11: Number of participants in FGD and Community Meetings

№	Area of Public Consultations	Date of Engagement	No. Participants
1.	Project site-Iguhu public meeting	February 21, 2025	44
2.	Gold mining site-Ivonda (FGD)	February 21, 2025	19
3.	Key stakeholder engagement - Iguhu	February 28, 2025	22
Total Number of Participants			**85**

CHAPTER 6: POTENTIAL IMPACTS AND MITIGATION MEASURES

6.1 Overview

This chapter presents the potential impacts associated with the project, perceived impacts by consulted stakeholders as well as the proposed assessment methodology and any potential mitigation options that have been identified at this stage of scoping.

6.2 Description of the Existing and Possible Impacts

6.2.1 Identification of key impacts

The key impacts listed in the following section have been determined through views of interested and affected parties; applicable legal, institutional, and regulatory frameworks; and professional understanding of the project team and environmental assessment practitioners.

6.2.2 Existing impacts

At the time of EIA scoping, there was no ongoing activity that could impact the environment as the proposed project site is in its natural setting with no alteration.

6.2.3 Anticipated impacts

The anticipated social and environmental impacts of the proposed project are both positive and negative. The magnitude of each impact is described in terms of being significant, minor or permanent, short-term or long term, specific (localized) or widespread, reversible or irreversible. The assessment criteria for the significant impacts are as shown in the table below:

Table 12: Assessment criteria for significant impacts

Key	**Type of impact**	**Key**	**Type of impact.**
++	Major positive impact.	+	Minor positive impact.
- -	Major negative impact	-	Minor negative impact.
0	Negligible/zero impact	NC	No change
Sp	Specific/localized	W	Widespread.
R	Reversible	Ir	Irreversible.
Sh	Short term	L	Long term.
T	Temporary	P	Permanent

6.3 Possible Impacts

6.3.1 Anticipated Positive Impacts During Construction and Operation Phases

Based on information gathered during both desktop, field study and public consultation, the potential environmental impacts of the proposed project are as tabulated below.

Table 13: Potential positive ecological, social and economic impacts

Nature of anticipated positive impact	Construction	Operation
Economic growth	+, L	++, L, W
Creation of employment opportunity	++, Sh, Sp	++, L,
Growth in the Mining Sector	0	++, L, P, W
Stream line gold industry	++, L, P, W	NC
Development in the area	0	++, L, P, Sp
Transfer of skills and technology	++, L, P, SP	++, L, P, W
Earn foreign exchange for the country	0	++, L, P, W
Economic utilization of idle space (optimal land use)	++, L, P, W	++, L, P, W
Promotion of aesthetic beauty	0	++, P, Sp, L, R
Corporate social responsibility	0	++, L, SP
Economic utilisation of idle space (optimal land use)	+, Sp, L	++, L, P,SP

The proposed construction and operation of Kakamega Gold Refinery Plant is anticipated to have these positive effects:

- **Economic growth**: refining gold adds value to it therefore fetching better prices in the international market which contributes to increased income for people and revenue to the governments during operation phase of the plant.
- **Employment opportunity**: the project shall create employment opportunity during construction phase. Locals shall be employed as masonry, electricians, drivers among others. The refinery shall create employment opportunities for skilled workers in the refining process, as well as related industries like transportation and logistics. The proponent is mandated to employ and train local to provide labour on the plant during operation.
- **Growth in the mining sector**: the refinery being the first in the country will set as an example and grow the mining sector.

- **Stream line gold industry**: during operation phase the project shall encourage artisanal miners to sell their gold through legal channels, reducing illegal activities and improving market access.
- **Development in the area**: gold refinery shall attract many people from different places in need of job opportunities, business opportunities and gold merchants. The influx of people will grow the real estate industry in the area, create market for food products, housing and many other services. The community will also benefit from the royalty earned from sale of gold.
- **Transfer of skills and technology**: the management of gold refinery through the state department of mining will train locals the emerging safe mining techniques, environmental, health and safety and rehabilitation of old mines.
- **Promotion of aesthetic beauty**: the project has provisions for green buffer zones and landscaping round the development. This will promote the aesthetic beauty of the project ensuring that it does not lose touch with the surrounding natural environment and landscape. It will also have the net impact purifying the air, beautifying the environment, benefitting the staff and workers' physical and mental health.
- **Benefit from corporate social responsibility**: the proposed project will come with CSR projects in the area both directly and from royalty give back from the government. Some of proposed CSR are improving water points, access roads, police station and school.
- **Earn foreign exchange for the country**: pure gold has high demand in the international market where it is used in jewellery and bank reserves. Exporting gold will earn the country foreign exchange which in turn will improve our currency, economy and many other benefits.
- **Economic utilization of idle space (optimal land use)**: the development will ensure that the currently unoccupied land (proposed site) is put into economic use for maximum economic returns.
- **Creation of business opportunities**: several business opportunities are anticipated around the site during construction to provide construction materials, social amenities for construction workers and many other.

During operation phase, the increased population at Iguhu will create market for different business and services.

6.3.2 Anticipated Negative Socio-Environmental Impacts and Mitigation Measures

The issues that are seen as likely to negatively affect the environment and population therein include the following:

Table 14: Anticipated negative socio-environmental impacts

Nature of anticipated negative impact	Pre-Construction	Construction	Operation	Decommissioning
Air quality degradation	0	--, Sp, Sh, T	-	--, Sp, Sh, T
Noise and vibrations nuisance vibration	0	--, Sh, Sp, T	-, L, Sp	-, Sp, Sh, T
Slope modification, runoff water and soil erosion control	0	--, Sh, Sp, T	-	-, Sh, T, Sp
Solid waste generation	-, T	--, Sp, Sh	-, Sp, L	--, Sp, Sh
Effluent waste generation	-	-, Sp	-, Sp	NC
Vegetation loss	-	--, Sp, R, Sh	0	-
Impact on fauna	0	-, Sp, T	0	-
Changes to the ecosystem	-	-, Sp, Sh, R	0	-
Increased energy demand	-, T	--, Sh, Sp	-, L, R	NC
Increased water demand	0	--, Sp	--, Sp, W	NC
Risk to health and safety (occupational safety and health risks)	-	--, Sp, Sh	--, R, L	--, Sp
Traffic and congestion	-	--, T, Sh	-, L	--, Sp
Project aesthetic and visibility	0	Sp, --	Sp, --,P	--, Sp
Disruption of infrastructural services	0	Sh, Sp, L	T, Sp	--, Sp
Water pollution (underground water)	0	-, T, Sh	0, -	-, 0
Flooding and drainage	0	-, T	NC	NC
Project aesthetics & visibility	0	-, T, R	0	0
Security concerns	0	-, T, Sh	++, Sp, L	NC
Sexual exploitation, harassment and abuse	0	-, T, Sh	--,W,P,	NC
Irresponsible social behaviour, prostitution, influx of huge population, and drug abuse, theft/burglary	0	-, T, Sh	--,W,P,	-,
HIV/AIDS & other Sexually Transmitted Infections (STIs)	0	-, T, Sh	--,W,P,	-,
Climate change Impact	0	--, W,R, L	--, W,R, L	--, W,R, L

(a) Air quality degradation

During the construction phase, dust is likely to be generated due to excavation activities for approach to pave way for foundations, wind blowing loosened soil by trucks, high speed of vehicles and trucks delivering materials and the impact of scooping away excavated soil. There may be significant air pollution due to combustion of fossil fuels from construction machineries like trucks, excavators among others.

During operational phase air quality is likely to be affected by toxic gases resulting from gold refining processes involving chemicals and high temperatures.

Fumes from Chemical Refining Generated during acid digestion, gold precipitation, neutralisation and may consist of Nox, Sox , Chlorine , Ammonia vapours etc. formed during reactions

- $Au + 3\ HNO_3 + 4\ HCl \rightarrow [AuCl_4]^- + 3\ [NO_2] + [H_3O]^+ + 2\ H_2O$
- $Au + HNO_3 + 4\ HCl \rightarrow [AuCl_4]^- + [NO] + [H_3O]^{++} H_2O$
- $HNO_3 + 3HCl \rightarrow NOCl + Cl_2 + 2H_2O$
- $2\ HAuCl_4 + 2\ NaHSO_3 \rightarrow 2\ Au + 8\ HCl + Na_2SO_4 + SO_2$
- $3\ SO_2 + 2\ AuCl_3 + 4\ H_2O \rightarrow 3\ H_2SO_4 + 6\ HCl + 2\ Au$
- $2\ AuCl_3 + 6\ FeSO_4 \dashrightarrow 2\ Au + 2\ Fe_2(SO_4)_3 + Fe_2Cl_4$

Fumes from Pyrometallurgical processes Generated during heating and melting and may contain untreated carbon compounds, dust particles, metal oxides, heavy metal vapours etc. ; fuel fired furnaces cause more fumes.

The proposed mitigation measure includes but not limited to:

- Numerous analyses will be conducted using Computational Fluid Dynamics to determine the correct placement of the exhaust system to ensure no recirculation into the system.
- During the construction phase, regular air quality assessment tests should be undertaken.
- Control speed of construction and material transporting vehicles and switch off machines when not in use.
- Friable material to be covered during transportation.
- Contractors will be required to maintain clean site and surroundings.
- Regular servicing and maintenance of vehicles, mobile plants and machinery. Use of low Sulphur or no Sulphur diesel in vehicles, machineries, equipment, plants, generators, etc.
- Speed limits should be marked and positioned on the haulage roads for drivers to follow.
- Provide workers with appropriate personal protective equipment.
- Compact any loose soils and ensure dust minimization through watering.
- The suction hoods should adequately cover the furnace mouth and ensure that all fumes are trapped.
- The cooled emissions to be pass through series of filters which trap the air - borne particulates before going to scrubber

- The scrubber units should have alkaline solution spray to neutralize acidity if any in the fumes, strained through filters in the chimneys to remove solid particles before being released in the environment.
- Monitoring the quality of the scrub solution as well as avoiding accumulation of sludge in the scrubber tanks should be practiced ensuring efficiency of installed scrubbers.
- Stack emission sampling to be done frequently by NEMA licenced laboratories and proponent obtain emission licences annually.

(b) Noise pollution

The construction work, delivery of building materials by heavy trucks and the use of machines/ equipment such as bulldozers, metal grinders and concrete mixers as well as other earthworks will contribute to noise pollution within the construction site and the surrounding area.

During operation, noise will mainly come from vehicles accessing the development, machines in it, among others. These are expected to produce noise but to the required levels. Increased noise levels can affect project workers, the nearby residents, passers-by and other people within the vicinity of the project site if proper mitigation measures are not put in place and abided by.

Proposed mitigation measures:

- Conduct regular noise level and vibration monitoring with their defects.
- Regular servicing and maintenance of vehicles, machines and equipment.
- Sensitize drivers to switch off vehicle engines when not in use and to avoid unnecessary hooting of vehicles.
- Providing workers with personal protective equipment such as earmuffs and face masks when operating noisy machinery/equipment during construction.
- Avoid the use of heavy machineries during excavation notifying residents.
- Construction activities to be carried out between 8:00am – 5:00pm, etc.
- Workers to be subjected to medical examination as per the Medical Examination Rule 2005.
- The following audits are to be done every after 12 months during operations as per the Occupational Health and Safety Act 2007: Occupational health and safety audits and noise Survey and risks assessment.

(c) Oil Leaks and Spills

It is important to note that oil/grease spills are prevalent in construction sites and in most areas that make use of petroleum products. Such products contain detrimental elements to the environment. They contain such heavy metals as mercury, lead and Sulphur among others. Though this may not be common at the site, it is wise to control and observe the little that could occur especially during maintenance of the involved machinery.

During occupation, oil spills are likely to occur in small quantities.

Proposed mitigation measures:

- All machinery must be keenly observed and maintained to prevent oil leaks.
- Maintenance must be carried out in a designated area (protected service bays) and where oils are completely restrained from reaching the ground.
- All oil products and materials like containers should be stored in site stores or in the contractor's yard. They should be handled appropriately to avoid spills and leaks.
- In case of an oil spill, oil absorbent materials e.g., absorbent granular or pad absorbents should be used to clean up the spill then the oil-soaked pads and granules should be put in disposal bags to be collected and managed as hazardous waste by a licensed hazardous waste handler.

(d) Surface Run-Off and Soil erosion

During construction phase, clearance of land and excavation works will lead to increased soil erosion at the project site and release of sediments into the natural drainage systems or River Yala.

During operation, the site shall be well landscaped and compacted therefore reducing the impact of soil erosion. However, pavements and uncontrolled roof water during rainy season can increase surface runoffs which eventually lead to flooding or soil erosion.

Proposed mitigation measures:

- Provision of soil conservation structures like planting ground cover vegetation (grass) on erosion prone areas to control occurrence of soil movement.
- Control construction activities especially during rainy / wet conditions to reduce loosening top soil by machines thus reducing chances of soil erosion.
- Avoid unnecessary soil excavations on the site to prevent loosening soil and exposure to eroding agents like water and wind.

- Landscaping: Re-surface open areas after completion of the project and introduce appropriate vegetation.
- Use of permeable pavement materials to improve seepage.

(e) Increased Generation of Solid Waste

A significant amount of solid waste will be generated in construction phase from excavation soil of foundations, clearing of vegetation at the construction area, packaging materials for cement, iron sheets cuttings, wood chippings, and plastics among others. Such wastes can be injurious to the environment if not well disposed through choking of water bodies and negative impacts on animal health. Some of these waste materials especially the plastic/polythene is not biodegradable may cause long term injurious effects to the environment. Even the biodegradable ones such as organic wastes may be injurious to the environment because as they decompose, they produce methane gas, a powerful greenhouse gas known to contribute to global warming.

During operation phase, waste production shall mainly be due to industrial processes and consumption of products. Solid waste shall mainly consist of hazardous waste from chemical processes, metal fillings and other domestic wastes. The project will generate hazardous and domestic waste, including.

- Domestic/general waste: they can also be referred to as domestic waste due to their non-hazardous nature. They include cut/pieces of linen, packaging materials, boxes, cartons, wrappings, plastics, bottles, polythene papers, food remains from the kitchenette.
- Paint related wastes: This will be generated from buildings' painting process during the operation phase of the facility. They include used/empty chemical cans, used oil/grease tins, paint filters, and paint suspended solids, among other wastes.
- Hazardous waste: empty oil/grease cans emanating from use of petroleum products, e.g., grease, Metallic wastes from industrial processes, coolant etc. for site vehicles, trucks, machineries and other equipment, among others. Used containers made from petroleum products as well as the used rags for cleaning the spills and excess grease during lubrications.
- Electronic and electric equipment will be produced when most of the equipment becomes obsolete from offices and repair of machines.

Proposed Mitigation Measures:

- Use of an integrated solid waste management system through a hierarchy options i.e. source reduction, recycling, composting and reuse shall be encouraged. This will facilitate proper handling of solid waste during construction & operation stage.
- Hazardous wastes to be handled with cared on the site before disposal
- The contractor and proponent to ensure they contract a licensed waste handler to collect all solid waste during construction and operational phase and dispose of at approved site dumping site within Kakamega County.
- Express condition shall be put in the contract that before the contractor is issued with a completion certificate; he will clear the site of all debris and restore it to a state acceptable to the supervising architect and environmental consultant.
- Materials from excavation of the ground and foundation works shall be reused for earthworks and landscaping.
- Bins/ receptacles shall be placed at strategic locations within the site as collection centres to facilitate separation and sorting of the various types of wastes.
- Re-using some wastes like cleared vegetation as fire woods.
- The proponent and contractor to practice Extended Producer Responsibility (EPR) on all chemical purchased for use on the site to reduce pollution and waste produced.
- The proponent to practice taking back of obsolete EED to manufactures for the purpose of recycling, reusing and reduction of e-waste.

(f) Sewage and Waste Water Handling

Waste water during construction phase include storm water, washings, waste water from temporary washrooms and many others.

During operation phases, waste water shall result from industrial processes which are harmful or poisonous due to contaminations. Other sources of waste water shall be black water from washrooms, grey water from washings and storm water.

Proposed mitigation measures:

- Provision of mobile latrines for the workers during construction phase.
- Procure and install a waste water treatment plant that treats effluent to NEMA discharge standards as per regulations.
- Locate the plant appropriately to avoid foul smell during desludging intervals.

- Reuse treated effluent for other purposes such as water gardens.
- Ensure the treatment plant has sufficient redundancy capacity to forestall any overflow in case of mishap.
- Contaminated waste water to be channelled into a septic tank and exhausted by a licensed exhauster.
- Properly design waste water management system with a proper maintenance plan.
- Routine check-ups and monitoring of the drainage systems to avoid leakages and blockages.

(g) Water Quality Degradation

Construction of infrastructures at the site shall involve several activities which directly affect water quality of the river and therefore negatively impacting on the aquatic life. Excavation activities poor solid and liquid waste management leads to increased sediments and solid waste on the site which shall eventually be washed into River Yala. This may result to water pollution, eutrophication, dead of aquatic animals and many others.

During operation phase of the project, influence of the proposed project in the area shall attract more artisanal miners using mercury to leach gold causing pollution in streams, rivers and other water sources of water.

The proposed mitigation measure includes but not limited to:

- Solid wastes to be put in a designated area for appropriate disposal
- Excavation to be done only where necessary
- Drainage channels to be created to prevent storm water with waste from entering the river
- Sensitising miners to adopt mercury free technologies like gravity separation, sluicing, and concentrators
- Sensitising ASGM on safe ways of handling mercury during gold mining.
- Ensuring all ASGM are licenced to easily monitor their activities during mining.

(h) Risk of Flooding

Drainage enhances effective flow of the surface run-off. Storm drainage within the area will be affected to some extent especially in areas where project activities will take place. Again, activities like plumbing works and site modifications will result in the alteration of the existing storm drainage patterns of the project area and site. Excavation works during construction phase may interfere with existing natural drainage system. For instance, excavated debris and other

construction waste if left on-site might accumulate and block the drainage channels hence altering normal drainage system.

Digging of trenches for the piping works for water will loosen and expose soil to agents of erosion, both wind and water (if undertaken during rainy season), this may result to contamination of waterbodies/sources in the area like R. Yala. The drainage of the general site is necessary to enhance effective flow of the surface run-off expected from impermeable parking areas, pavements, slabs, among others, within the site. Besides risks of flooding, project activities can result in exposure of the top soil to agents of soil erosion thus increased soil erosion.

The proposed mitigation measure includes:

- Carrying out flood analysis before construction
- Stabilizing excavated areas.
- Minimizing land modification following established design considerations.
- Construction of structural erosion prevention measures.
- Provision of sediment traps.
- Provisions for protection of overburden material, etc.
- Backfilling with excavated soil.
- Topsoil will be reused for landscaping.
- Install a silt fence at the bottom of the slope.
- Use of gravel bags to trap sediment.
- Provide a concrete pad with hosepipe at construction site access to wash tyres and prevent sediment from being tracked onto the natural drainage system
- Cover piles of material to be with tarpaulins when dry.
- Use lattice blocks allowing rain water to percolate into the ground thereby reducing the impact of rainwater run-off in the neighbourhood.

(i) Loss of Vegetation Cover

The proposed project site is in its natural condition with its natural vegetation still intact. The vegetation mainly comprises of indigenous trees, exotic trees, grass and undergrowth vegetation. Minimal disturbance is expected as a result of movement of construction machineries, equipment, etc. during project works. The project site has no endemic vegetation that can be impacted upon by the project activities.

During occupation phase little impact shall occur on the vegetation cover.

Proposed mitigation measures:

- Undertake tree count and map out those to be affected during construction.
- Where possible design structures around trees to avoid unnecessary cutting.
- Avoid locating structures where there's dense growth.
- Compensate affected trees by replanting others.
- Avoid cutting of indigenous trees where possible.
- Buffer the neighbouring development by planting trees along the fence.
- Protect indigenous and exotic tree species within the property.
- Confining disturbance to areas that will be utilized, etc.
- Recognition of economic and social values of the trees before destruction.
- Green buffer zones at front and back of the site to be established after construction.
- Avoid chemical contamination of soil or directly on vegetation covers in the area

(j) Negative Impacts on Fauna

Vegetation and bush clearing and removal of top soil during construction enhances potential negative environmental impacts which damages wildlife habitat particularly burrowing animals and rodents, moles and rabbits and birds. Generally, animals are less affected by construction activities than plants. While transporting materials to the site invasive vegetation may be introduced in the area. Excavation works increases sedimentation and poor waste management can lead to eutrophication and oil spills which directly causes aquatic habitat fragmentation and death of aquatic animals. Eutrophication directly affects BOD for aquatic animals like fish.

Proposed mitigation measures:

- Selective de-vegetation will lead to less disturbance of the animal's natural habits like the insects and perching birds.
- Encourage re-vegetation upon completion of the project to ensure for proper care for earth and underground living organisms.
- Creation of awareness.
- Green buffer zones established.
- Revegetation of the resultant project site with indigenous vegetation, flowers and trees for aesthetic beauty.

(k) Interruption of Infrastructural and Utility Services

Civil works may lead to damage of infrastructure during trenching along and across the underground water pipelines; Kenya Power and Lighting Company's overhead and underground electricity cables/wires; among other affiliated utility infrastructures. The damage could extend to nearby storm drains, fiber optic cables, data and internet cables.

During operation phase we don't anticipate any disruption of the utility.

The mitigation measures include:

- Strict adherence to project designs.
- For any relocation of infrastructure services such as water pipes, telecommunication cables and Kenya Power and Lighting Company power lines, the proponent and project contractor should contact the service technicians or relevant authorities, among others.
- Prior notification to utility service users before disruption.
- Provision of alternative utility services for the period of interruption.

(l) Risks of Fire

The operations that lead to fire outbreaks include poor handling of faulty electrical equipment, smoking near flammable substances like fuel, paints, carelessness etc. These should be avoided both during construction and operation phases of the project.

Proposed mitigation measures:

- Provision of firefighting equipment and hydrant points near the construction site.
- Display emergency fire evacuation procedures and emergency numbers for ambulance or fire marshals at the site.
- Provision of sufficient fire exit points and fire assembly points at the construction camp.

(m)Occupational Safety and Health Risks

Project work may result in increased risks to health and safety such as dust, air, and noise pollution. Exposure to workplace accidents can cause risks to both workers, immediate residents, neighbours and the public. The workforce and public involved will be more subjected to these environmental hazards and disturbances.

- ✓ ***Occupational Safety and Health Risk (Construction Worker)***

Workers at the site may be exposed to various workplace accidents especially during construction period. These include being hit by falling objects and falling off from elevated heights, among others. During operation period, accidents may include exposure to exposed electrical parts, inadequate signage at the site, and speeding of vehicles. The operations that lead to fire outbreaks include poor handling of flammable substances and electric wires; faulty electrical equipment; negligence, etc. During the operation phase of the project, only occupational risks are anticipated. Staff will be exposed to indoor fumes, ergonomic hazards, among other occupational accidents.

The possible mitigation measures include:

- Provide personal protective equipment i.e., safety boots, helmet, goggles, respiratory equipment, gloves, overalls and hard caps to be always used on site and workers trained on the proper use of tools.
- HIV/AIDS awareness on site.
- Use of barriers and guards as necessary to protect the public/onlookers from physical hazards. Danger warning or CAUTION will be put at strategic places in national languages (Kiswahili and English) e.g. “No Entry of unauthorized staff”, Men at Work’’, “Danger.”
- Firefighting equipment will be provided, and all employees are trained on how to use them.
- Sanitary facilities, for example portable toilets shall be provided and cleanliness ensured.
- A fully equipped first aid kit shall be provided and managed by qualified people, i.e., trained first aider. A wellness centre should be in place.
- Adherence to OSHA, subsidiary legislations, EMCA and Public Health Act.
- Proper display of warning/informative signs will be provided at the site and along Kakamega Kisumu Road to warn motorists and the public, etc., e.g., ‘Heavy vehicles turning’, ‘Authorized personnel Only’.
- Security patrols around the construction site.
- Contractors with a good track record of following Occupational Health and Safety rules will be preselected for the contract.
- Regular Health and Safety Training sessions will be held during construction and operation phases.
- All machinery and equipment shall be well maintained to prevent premature failure or possible accidents.
- An emergency response plan will be developed and implemented.

- Elimination of reversing into the main road or onto site by providing one-way systems and turning areas within the site.
- Ensure that equipment and parts of equipment such as elbows of cranes, excavators, loaders amongst others, do not swing into the path of vehicles or pedestrians.
- Provide shade netting to trap small pieces of ejected material during construction.

(n) Public Health and Safety Risks

During construction phase, there may be increased risks to health and safety to the general public. If the sites under construction are not condoned, public is at risk of accidents and injuries e.g. from sharp objects, open excavations, moving vehicles among others.

During operation, only occupational risks are anticipated like motor vehicles accidents and staff accidents from production processes.

Proposed mitigation measures:

- Secure construction site by fencing with iron sheets and provide warning signage at the entrance of the construction site.
- All open trenches and pits like foundations to be safe guarded by safety tape around to warn workers or visitors about their presence.
- Conduct statutory assessments i.e. risk assessments, fire safety audits and Occupational Safety and Health audits annually through licensed advisors and auditors by the Directorate of Occupational Safety and Health Services (DOSHS)
- Provision of firefighting equipment in strategic and well labelled sites
- Use signage to inform staff and/ or visitors of fire escapes, fire assembly, restricted access areas, non-smoking areas, closed closure, speed limit among others. The signage must be visible and placed strategically; and
- Develop an evacuation procedure to handle emergency situations during operation and construction phases.

(o) Conflict with the Community

The magnitude of the proposed project usually is accompanied with conflicts between the contractor, proponent and local residents. Conflicts can arise as result of discriminative employments, interference with historical sites, dust emissions, indiscriminatory CSR project development, noise pollution, encroachment to people's land among others.

Proposed mitigation measures:

- Public consultation with the Residents of Kakamega South and other stakeholders like County Government, local administration to be done continuously.
- The contractor and proponent to shall ensure a good percentage of local people are given first priority in employment opportunity.
- Assist the community to formulate project development committee and grievance redress mechanism (GRM).

(p) Gender Empowerment

There is need to promote gender equality in all aspects of economic development and more so in construction and operation of the refinery. More often, women roles in construction are mainly confined to supply of unskilled labour and vending of foodstuffs to the construction workers.

Proposed mitigation measures:

- Give equal employment opportunities for both men and women and encourage women to apply in skills they can be good at.
- Expose and involve women in construction and maintenance activities in an effort to transfer required skills to them
- Involve women groups in activities that they are good at such as environmental management of the refinery operation such e.g., planting trees and grass.
- Enhance gender sensitivity and reduce gender discrimination in construction activities.

(q) Changes to the Ecosystem

Project activities may result in changes in the ecosystem of the project site and area, thereby impacting negatively such areas.

The proposed mitigation measures include:

- Carry out selective de-vegetation.
- The resultant project site after project implementation will be revegetated by planting trees and aesthetic flowers (landscaping and greening).
- Cleared areas will be replanted after project implementation activities.
- Indigenous trees and those of value will be conserved.
- Conserve trees that are not in areas designed for structural buildings.

- Avoid locating buildings where there is dense growth.
- Strict adherence to project designs and plans, etc.

(r) Increased Energy Demand

Construction and operational phases of the project will create additional demand for energy supply within the project vicinity. Increased energy demand may suppress or put a lot of pressure on the available energy sources. Miller process and Cupellation are two methods used for refining gold and consuming approximately 300 to 350 kWh/ton of electricity. To ensure energy sufficiency and efficiency, the facility will have a dedicated 11KV medium voltage power supply line. It will also have a substation later. Finally, the facility will employ backup generators to help meet its energy needs during grid electricity power outages. Renewable energy sources like solar energy will also be tapped for solar water heating. Diesel fuel will be used to run backup onsite diesel generators.

Mitigation measures are:

- Ensure Kenya power electricity supply line in the area has sufficient spare capacity.
- Back-up generators to be installed.
- Solar panels to be installed for power generation and for heating water.
- Power backup batteries to be installed.
- Conduct energy use audits.
- Employ energy saving initiatives at the project site and facility during the operation phase.
- Provide notices and information signages on energy and water use.

(s) Increased Water Demand

Construction and operational phases of the project will create additional demand for the water supply within the project vicinity. Increased water demand may suppress or put a lot of pressure on the available sources. To ensure for water use efficiency and sustainability, the water used in the project implementation process will all be reused, recycled or renewed. The project will harness rainwater and store in rainwater storing tanks for use during the operation phase. This will supplement the available supply to the facility. The recycled effluent will be used for greening and landscaping. To ensure for water use efficiency and conservation, landscaping works will involve use of indigenous and water efficient plants. During the project's operation phase, water demand will be minimal due to the low number of workers at the facility.

The proposed mitigation measures are:

- Apply for WRA permit in case of need to use or abstract water from Yala River.
- Water efficient plants and indigenous to be used for landscaping and greening activities.
- Harvest and store sufficient water.
- Reuse effluent treated water for greening and gardening.
- Limit paved areas to allow water percolation to recharge aquifers.
- Conduct regular water system audits to identify and rectify any possible water leakages.
- Re-use water e.g., used water from cleaning construction equipment can be sprinkled on the haulage road to reduce dust emissions.
- Reuse water for cooling and heating production equipment and machines within the site to avoid wastage.
- Install water use regulation systems.
- Rainwater harvesting and storage as per the Rainwater Harvesting and Storage Regulations.
- Install water meters to determine water consumption rate.

(t) Traffic Congestion at the Project Site

The project works are expected to have negligible effects on the normal traffic flow on the major and access road like Kisumu-Kakamega Road. Therefore, minimal traffic disturbances are expected from construction material transporting vehicles; machineries; trucks; and, vehicles accessing the project during construction and operation phases. During the facility's operation phase, traffic is expected to be very minimal as it does not rely on big number of moving machines.

Mitigation measures include:

- Provide for acceleration and deacceleration lanes.
- Install the security check 20m off the road into the property.
- Always, trucks and other vehicles to be parked inside the property.
- An initial traffic impact assessment study should be conducted and a report prepared for the project.
- Speed limits and all other road signs and traffic rules shall be strictly observed.
- A traffic marshal shall be stationed along the entry point within the project boundary to control vehicles during transportation of materials.
- Provide reflective road signs on both sides of the working area at a distance not less than 50m from the works. The logo must be approved by KENHA.

- Proper display of warning signs such as 'Road works ahead', 'slow down', 'Road diversion ahead', among others.
- No reversing on to adjacent roads.
- Drivers to be warned against parking their trucks along the roadside.
- Provision of designated entry and exit points.
- Minimal vehicular traffic is expected during the operation phase.

(u) Aesthetics and Visibility

Construction activities involving clearing of vegetation, top soil stripping and construction of the gold refinery will have negative impact on the aesthetic values of the neighbourhood area. This is considered in the context of the adjacent facilities and natural landscape structures. It is considered that the new infrastructural structures especially chimneys within the project area will dominate the skyline. An appropriate level of external lighting will be installed for operational and security purposes. Therefore, the proposed project will pose major visual impact.

The proposed mitigation measures are:

- Maintain the character of the surrounding by adopting appropriate roof color.
- Ensure that the project is consistent with the neighborhood character.
- Ensure the height of buildings is consistent with neighborhood.
- Consider suitable paint color for large structures that can blend with the background to minimize visual impact to adjacent areas.
- Consolidating facilities within the boundaries of the project area. Designing fencing to follow the contour of natural and planned vegetation to maximum visual screening to the extent practicable.
- Use of directional lighting to limit light spill (i.e., spread of light outwards from where it is needed into adjacent areas).
- Comprehensive landscaping to be undertaken upon project completion.
- A green buffer with active vegetation to be created.

(v) Prostitution, Theft, Alcoholism and Abuse of Drugs

The project of such magnitude attracts different classes of people from other places who come with foreign social behaviours and business activities that does not conform to morality of the area.

The proposed mitigation measures include:

- Increase opportunities to uncover employee theft – establish a policy that enables employees to report thefts and other crimes committed by co-workers without fear of exposure or reprisal.
- Security patrols by a private security firm to ensure no illegal businesses in the area.
- Illegal businesses activities will be discouraged in front of the property.
- Prohibit smoking within the project site.
- Peer intervention: employee alcohol education programs may prepare peers to suggest assistance to one another
- In addition to alcohol education programs, contractor also may offer health promotion programs, which may motivate employees to alter their drinking behaviours
- Strict supervision of workers
- Contractor can adopt a workplace alcohol and drug/substance abuse policy that will reduce the loss of productivity and provide a safer work environment for all.

(w) Security Issues/Concerns

The presence of labourers and expensive construction equipment, machinery and materials at the site could potentially pose a security risk. Furthermore, offenders may capitalize on the increased movement during the construction phase, and the anonymity created by the construction activities to carry out criminal activities at the site and its surrounding areas. The impacts on the area's security are considered to be minimal.

During operation, it is well known that gold is highly sought after mineral due to its market value. This might attract robbers and burglars in the area

The mitigation measures are:

- Fence/ cordon the construction site.
- Ensure 24-hour private security patrols by a professional security company.
- Install CCTV cameras.
- Restricted facility visits through prior clearance.
- Minimal human traffic during the operation phase.
- The site shall have a police station within during operation phase.

(x) Sexual Exploitation, Harassment and Abuse

Sexual exploitation, harassment and abuse may occur amongst construction workers and to a large extent the host community. This negative behaviour can result to unwanted or early pregnancies among teenagers, increase in STIs, contributing to low self-esteem to the victims.

Proposed mitigation measures:

- All personnel to be sensitised about risks of sexual exploitation, abuse and harassment.
- Effecting an organisational culture of zero tolerance; create and nurture an organisational culture based on accountability where there is a zero tolerance for sexual exploitation, abuse and harassment, where rights are recognized, promoted and protected and where violations are actively prevented.
- Reporting mechanisms that are safe and trusted; empower and support workers and partners to feel safe to report violations and to feel safe that reports will be handled in a manner that respects due process and other human rights.
- Swift and credible investigation and sanctions; ensure a fair process for swift and credible investigations and sanctions for violations by the contractor and actively promote swift and fair investigations and sanctions by the government.
- Survivor-centred response; provide survivor-centred assistance and support that is timely, predictable, sustainable and adequately resourced.
- Engaging partners in the fight against sexual exploitation, abuse and harassment; engage and equip individuals and local administration as allies in preventing and responding to sexual exploitation and abuse and sexual harassment.

(y) HIV/AIDS & other Sexually Transmitted Infections (STIs)

Many cases construction activities involve influx of people from other areas who ended engaging social behaviours that are likely to course spread of HIV/AIDS and STI.

Proposed mitigation measures:

- Efficient implementation of the HIV/AIDS and STI prevention programme.
- Increased awareness to translate into attitudinal changes.

- Facilitate information sessions at worksites and allow selected workers to attend training courses.
- Trained health workers to be engaged in STI treatment.
- Identifying and implementing measures to ensure availability of good quality condoms to construction workers and the community.
- Contractor to cooperate in allowing patients to be treated.
- Local clinics and medical centres to cooperate in treating patients at affordable costs.
- Encouraging young people to abstain from sex till marriage and avoid extra marital sex in order to curb sexually transmitted disease.

(z) Climate Change Resilience and Adaptation

Climate change is impacting our world with increasing severity and frequency, and the need for resilience in our built environment has never been more critical.

Many green building ratings recognized worldwide e.g. Leadership in Energy and Environmental Design (LEED) which is the rating for this project focus on sustainable and environmentally responsible building practices, and resilience for the future projected hazards. This enables the project design team to promote comprehensive assessment of; observing projected future natural hazards and creating a resilient strategy to avoid disaster in case the hazard occurs.

Factors likely to lead to climate change due to the operation of the gold refinery include:

- Emissions of CO2 and other greenhouse gases as by-products of the diesel consumed in backup generators, the fuel used in deployed service vehicles and the refrigerant gases (fugitive emissions) associated with the air-conditioning systems in the buildings. The air conditioning systems normally use HCFCs (refrigerants)like; R-22, R-123, R124, R401A, R401B, R402A, R-403B, R-408A, R-409A,R-414B and R-416A.Some HFCs commonly used include; R134a, R404A, R-407C, R-410A, R-417A, R-422A, R-422B, R-422D, R-507, R-508B. The HCFCs have only about 10% of the ozone depleting potential as CFCs. Unfortunately, HCFCs are Greenhouse gases which possess very high global warming potential than CO2 despite their very low atmospheric concentrations. The HFCs on the other hand do not contain any ozone depleting Chlorine, but have global warming potential, although lower than HCFCs. To avoid use and emissions of both hydro fluorocarbons (HFCs)

and hydro chlorofluorocarbons (HCFCs), a variety of climate-friendly, energy efficient, safe and proven alternatives should be adopted by the proponent.

- Indirect emissions associated with the consumption of purchased electricity, improper garbage disposal (methane) and clearing and cutting of trees to construct refinery related projects. Emissions from backup generators, fleet vehicles and other equipment are due to inefficient combustion systems and use of unclean fuels. These emissions include NOx (oxides of Nitrogen), SOx (oxides of Sulphur), Ozone (O3), carbon monoxide and the notorious greenhouse gas Carbon dioxide.

These pollutants have different impacts on the stratosphere leading to climate change, acid rain and impacts on human health.

The proposed mitigation measures are:

- Proponent to plant trees and improve carbon sinks in the area.
- The proponent to consider use of renewable energy sources like solar as part of climate change adaptation measures.
- Practice Carbon Capture and Storage (CCS) from gold refining plant and store it underground can prevent its release into the atmosphere.
- Provision of civic education to local community about climate change, and adaptation practices i.e., practices such as adopting organic farming among others.
- Avoid construction along R. Yala, which is wetland and can act as carbon sink.

CHAPTER 7: ANALYSIS OF PROJECT ALTERNATIVES

7.1 Overview

This chapter analyses alternatives to construction of the proposed project in terms of project in terms of the site, products, materials and technology. Also, impacts of each alternative are identified, discussed and compared with those of this development proposal. These alternatives included:

7.2 The Proposed Project

The proposed project involves construction of a Gold Refinery at Kakamega South Sub-County from which mined gold from Kakamega, Vihiga, Nandi and other neighbouring gold mining areas shall sell their unrefined gold for processing. The project is the first one in the country and it will be a game changer to the region where gold has been mined since colonial era.

7.3 Construction Techniques Alternative

The various techniques in construction will either use of both heavy machinery or labour intensive. Labour intensive approach alone has limitations such slow work progress since excavation works and transport of materials easily be achieved using machines. From a positive perspective labour intensive techniques are environmentally friendly compared to the use of heavy machinery. In respect to the new construction and maintenance, use of heavy machinery may be favoured more than labour intensive methods for the speedy implementation of the project.

7.4 Material Alternatives

development include Eco BEAM. EcoBEAM is an earthbag building system that constructs a house’s walls out of sandbags. A metal lattice structure provides a framework for the house and sandbags are stacked inside, ultimately being covered in earthen plaster to finish the walls (Brown, 2009. The overall use of alternative building technologies is limited as contractors prefer to use conventional building materials and technologies that they are familiar with (Oguchukwu, 2015). Another hinderance factor as noted by the Human Settlements Review, is that most government housing officials are unknowledgeable about how projects using alternative building technologies and materials are to be managed and implemented (Human Settlements Review, 2010). Furthermore, some professionals in the construction industry avoid using alternative building

technologies because they think these technologies are more expensive than conventional building methods (Leveraging, 2017).

Due to these hinderance factors and others more, conventional construction materials are still more preferrable as compared to the alternative building technology in the country. As such, some of the key construction materials to be used in the implementation of the proposed project will be concrete mixture from quality cement, sand, ballast; water; steel and iron metals; red volcanic soil, reinforcement, aggregate, stone dust, plumbing and drainage materials, electrical and ICT materials, landscaping materials, AC materials, building chemical materials, waterproofing materials, finishing materials including doors, windows and curtain walls, ceiling materials, floor finishing materials, wall finishing materials, sanitary materials and furniture, water and oil-based paints, among other materials which have no alternatives since they've been tested and proven as the best for construction works of any nature. Modern, locally and internationally (ISO Certified) recognized and certified materials will be used to ensure for public health safety, security and environmental aesthetic requirements.

Equipment and machines that use energy and water efficiently will be given first priority without compromising on cost or availability factors. Land will be optimally and economically used throughout the implementation phases of the project as per the design guidelines. Therefore, it is advisable that the recommended recognized and certified construction materials be used for project implementation.

Energy - Gold refinery requires huge amount of energy to run machines, heating and electrolysis processes. Currently in the region the most reliable power supply is KPLC from grid. However, renewable energy integration, as a means of reducing the environmental impact of power generation and reducing electricity is recommended.

7.5 Description of all alternatives

7.5.1 Site alternatives

The proposed project site is ideal from the point of view proximity gold mining sites, Yala River for supply of water for various industrial use and availability of fallow land.

7.5.2 No project alternatives

The proposed Gold Refinery Factory will utilize a land otherwise left idle with no economic activity on going. The proposed project will therefore lead to the economic utilization of the land. On the other hand, the beneficiary of the project is artisanal miners whom for long time have been exploited by brokers buying unpurified gold at a very low price and letter resale to make huge prices. The project will hugely boost the economy especially the mining sector which remain untapped but with huge potential.

The management of Gold refinery will be able to pass important skills, technological development and knowledge in the gold mining sector especially safe mining. Gold mining currently is associated with unsafe shaft mining leading to collapse in most cases.

The project will also lead to significant increase in job opportunities both during construction and operation phase of the refinery and above generating revenue to the government in terms of taxes.

The no project alternative implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will, however, involve several losses to the proponent, central & local government, and the community as a whole. The no project option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The economic status of Kenyans and the local people would remain unchanged.
- The local skills would remain underutilized.
- Continuation on exploitation of artisanal miners by brokers
- Reduced interaction both at local, national and international levels.
- It will not contribute to employment opportunities particularly artisanal miners.
- Increased urban poverty and crime in Kenya.

From the analysis above, it is apparent that the no project alternative is not best alternative to the proponent, Kenyans and the Government of Kenya.

7.5.3 Technology Alternatives

The management of Gold refinery should share technological advancement in gold mining to reduce use of mercury which has health risks. The artisanal miners typically work in small groups, using manual labour to dig and extract the ore. The ore is then processed using mercury, a highly

toxic element that binds with the gold and forms an amalgam. Unfortunately, many artisanal miners in Kenya are unaware of the risks associated with using mercury in ASGM and lack an alternative to mercury for those who know the risks. They often use mercury without any protective gear and are not trained in handling the element safely. This lack of awareness and lack of an alternative to mercury has led to the widespread release of mercury into the environment, creating significant public health issues.

Mercury in Artisanal small-scale gold mining (ASGM) is a major cause of environmental pollution and poses significant risks to human health. When mercury is released into the environment, it contaminates water bodies, soil, and air. This contamination can lead to serious health risks for those who come into contact with it. Exposure to mercury can cause neurological damage, kidney damage, respiratory problems, and other health issues.

The management of the Gold Refinery should identify alternative mercury free gold extraction methods such as gravity concentration, magnetic separation, and flotation have been used instead. Some methods that have been developed to replace mercury in gold mining include borax and activated carbon, while the ideal method to replace cyanide is the use of thiosulfate.

7.5.4 Material Alternatives

The buildings will be constructed using modern, locally and internationally accepted materials to achieve public health, safety and environmental standards and aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. The concrete pillars and walls will be made using locally sourced stones, cement, sand (washed and clean), metal bars and fittings that meet the Kenya Bureau of Standards requirements.

Beautiful and durable clay tiles will be used because they are good in heat insulation as compared to the iron sheet roofs. Heavy use of lumber is discouraged because of destruction of forests.

7.5.5 Analysis of Alternatives

Faced with the foregoing, the proponent wishes to take advantage of the infrastructure already in place and use it as a platform for the intended project. The proposed project option is the most suitable one both from an environmental perspective and also from an economic angle. Also, the proposed project is in line with the Standard Development Goals and vision 2030.

CHAPTER 8: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

8.1 Introduction

An Environmental Management and Monitoring Plan (EMMP), also referred to as an impact management plan, is usually prepared as part of the EIA reporting. It translates recommended mitigation and monitoring measures into specific actions that will be carried out by the proprietor.

An ESMP outline is developed to ensure sustainability of the project, from construction through to operation. The plan provides a general outlay of the activities, associated impacts, mitigation action plans and appropriate monitoring indicators. Implementation timeframes and responsibilities are also defined. The primary responsibility for the integration of the mitigation measures for the proposed development lies with the project proponent and by extension the contractor during the construction stage, while the proponent takes over the duty upon commissioning of the project. At every stage, the objective should be to ensure that the specified mitigation measures are implemented.

8.2 Significance of an ESMP

Environmental and Social Management Plan (ESMP) for development projects is usually to provide a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition, the ESMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done. The ESMP is therefore a vital output of ESIA that provides a checklist for project monitoring and evaluation of any development project. Its purpose is to establish benchmarks so that the nature and magnitude of anticipated environmental and social impacts can be continually assessed. Monitoring involves the continuous or periodic review of construction and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

In a nutshell the ESMP conveys the Project's environmental and social constraints and ensures that the Project will comply with all local laws and regulations, which seek to ensure that the construction work does not adversely affect the environment and social community resources. The Supervising Consultant may periodically revise the ESMP in consultation with the Contractor, and

subject to the approval from KeRRA and NEMA. Revisions may be made to accommodate changes in work, weather, and site conditions. ESMP is a binding document between the CLIENT and the CONTRACTOR so that noncompliance on the part of the contractor is punishable. The ESMP should be made available to all Project Staff. In summary, the ESMP addresses the following objectives:

- To bring the project into compliance with applicable national environmental and social legal requirements
- To outline the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimize, mitigate, or compensate for adverse environmental and social impacts, or to enhance the project beneficial impacts
- To address capacity building requirements within the relevant stakeholders where necessary.

Environmental audits are supposed to be carried out one year after completion of the project. These audits assess the relevance, efficiency and impact of any mitigation measures that have been employed. The ESMP outlined below will address the identified potential negative impacts and mitigation measures of the proposed project, which must be reviewed regularly after implementation of the project.

8.3 Environmental Monitoring and Audits

Environmental monitoring and audits are essential in Project's life span as they are conducted to establish if project implementation has complied with set environmental management standards for Kenya as spelt out in EMCA Cap 387 and the Environmental (Impact Assessment and Audit) Regulations 2003. In this Project, environmental monitoring and audit will be conducted to ensure that identified potential negative impacts are mitigated during the project's life span.

8.4 Environmental and Social Action Plans

The Environmental and Social Action Plan (ESAP) is a tool used by the client to ensure that any outstanding issues at the construction site are addressed in a timely and appropriate manner, and to ensure continued compliance with the financier's environmental and social compliance requirements, as well as local legal requirements. Submission of the ESAP to the CLIENT may be a covenant of the construction.

The format of the ESAP will depend on the nature of the operation and the actions that are required. However, the following key elements should be sufficient:

- The environmental/socio-economic/cultural aspects (Issue/impacts)
- Management actions (Action(s) required)
- Responsibilities (person in charge)
- Implementation timelines (Timing/ completion deadline)
- Main target areas of the corridor (location)
- Expected output (results)
- Monitoring parameters (indicator/markers)
- Cost estimates per action (Cost/financing).

It is proposed that ALL audits and inspections carried out during the construction works should be followed with clear ESAP to illustrate route map proposed by the contractor to improve the project's environmental and social performance. The contractor will be responsible to oversee and implement the components indicated in the Environmental and Social Management Plan.

Table 15: Environmental and Social Management Plan

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
Pre-Construction Phase						
Vegetation loss	Exposure of the top soil to agents of soil erosion thus increased soil erosion.	Undertake tree count and map out those to be affected during construction Where possible design structures around trees to avoid unnecessary cutting. Avoid locating structures where there is dense growth. Compensate affected trees by replanting others. Preserve trees within the project boundary. Buffer the neighbouring development by planting trees along the fence. Protect both indigenous and exotic tree species within the property. Green buffer zones at the front and back of site. Confine disturbance to areas that will be utilized, etc.	Number of transferred trees. Landscaping status. Established green buffer zones.	Contractor and State department of Mining	Site preparation and decommissioning phases	80,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
Runoff water and soil erosion control	Altered natural slope Increased air pollution due to airborne stockpile. Air pollution. Loss of top soil profile.	Stabilizing excavated areas. Minimizing land modification following established design considerations. Construction of structural erosion prevention measures. Provision of sediment traps. Provisions for protection of overburden material, etc.	Levelled ground/soil after project implementation. Well covered stockpiles. Decreased siltation. Reduced soil erosion and improved drainage.	Contractor and State department of Mining	Site preparation and decommissioning phases	51,000.00
Noise and vibrations nuisance	Noise pollution	Conduct noise assessment baseline study. Conduct regular noise level and vibration monitoring with their defects. Provide workers with personal protective equipment. Construction activities to be carried out between 8:00am – 5:00pm.	Noise quality monitoring assessments	Contractor and State department of Mining	Site preparation and decommissioning phases	60,500.00
Air pollution	Increased soil erosion	Regular air quality assessment tests to be undertaken with a baseline referral point. Regular servicing and maintenance of vehicles, mobile plants and machinery. Provide workers with appropriate personal protective equipment.	Regular air quality monitoring assessments	Contractor and State department of Mining	Site preparation and decommissioning phases	42,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		Compact any loose soil and ensure dust minimization through watering.				
Effluent waste generation	Poor environmental aesthetics	Procure and install a wastewater treatment plant that treats effluent to NEMA discharge standards as per regulations. Locate the plant appropriately to avoid foul smell during desludging intervals. Reuse treated effluent for other purposes such as watering landscape gardens. Provide mobile toilets.	Proper effluent waste management	Contractor and State department of Mining	Site preparation and decommissioning phases	35,000.00
Climate Change Resilience	Environmental climate changes like flooding, droughts, pests and diseases	Proponents to actively participate in tree planting activities and improve carbon sinks in the area. The proponent should consider using renewable energy sources like solar as part of climate change adaptation measures. Practice Carbon Capture and Storage (CCS) from gold refining plant and store it underground can prevent its release into the atmosphere. Creation of climate resilience policies and goals for the project Provide civic education to local community about climate	Presence of climate change abatement measures	Contractor and State department of Mining	Site preparation , construction and decommissioning phases	5,000,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		adaptation practices through practicing sustainable agriculture like reducing fertilizer and pesticide use, shifting to organic and regenerative farming, and integrating trees into farms (agroforestry) to reduce emissions from agriculture. Avoid construction in the areas bordering R. Yala which is a wetland and can as carbon sink.				
Flooding and drainage **(Blocking or drainage pattern alteration)**	Altered natural drainage pattern Flooding	Follow established design considerations. Proper drainage system in place. Design considerations for green areas meant for surface runoff percolation for ground water recharge implemented.	Improved site drainage	Contractor and State department of Mining	Site preparation and decommissioning phases	37,450.00
Construction phase						
Air pollution	Contamination of air quality with emissions (gaseous (carbon iv oxide, dust, etc).	Regular air quality assessment tests to be undertaken with a baseline referral point. Regular service and maintenance of vehicles, mobile plants and machinery. Provide workers with appropriate personal protective equipment.	Regular misting of dusty haulage road. Review log sheets and ensure regular servicing of the vehicles, equipment and machines. Records of provision of personal protective equipment.	Contractor and State department of Mining	Construction and decommissioning phases.	125,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		Compact any loose soil and ensure dust minimization through watering. Control speed of construction and material transporting vehicles and switch off machines when not in use. Use of low sulphur or no sulphur diesel. Control speed and operation of construction vehicles.	Use of PPEs in areas involving dust and harmful gaseous evolution.			
Noise & excessive vibrations	Increased noise levels leading to nuisance to the neighbours, public and employees (workers).	Conduct noise assessment baseline study. Conduct regular noise level and vibration monitoring with their defects. Providing workers with personal protective equipment. Construction activities to be carried out between 8:00am-5:00pm. Regular servicing of machines and equipment. Sensitize drivers to switch off vehicle engines when not in use and to avoid unnecessary hooting of vehicles.	Review log sheets and ensure regular servicing of the vehicles and machines for use during cable tunnel excavation and drilling of holes. Records of PPE provided per staff likely to work in a noisy.	Contractor and State department of Mining	Construction and decommissioning phases.	100,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
Occupational safety and health risks	Accidents due to unsafe work practices, incompetency or occupational hazards. Risk to public safety i.e., on lookers.	Provide protective gears to workers. Secure project site from unauthorized entry. Install warning signages. Conducting safety training. Carry out project works within the permitted timelines, i.e., no late night or early morning construction works. HIV/AIDS awareness management protocols on site. Use of barriers and guards as necessary to protect the public/onlookers from physical hazards. Provide fire extinguishers Sanitary facilities for example portable toilets shall be provided and cleanliness ensured. Provide a fully equipped first aid kit managed by qualified persons. Adhere to OSHA Act, subsidiary legislations, EMCA Act and Public Health Act. Establish a wellness centre.	Records of issuance of personal protective equipment to workers. Ensure use of personal protective equipment by workers during construction (installation). Presence of a cordon line. Presence of a fully stocked first aid kit.	Contractor and State department of Mining	Construction and decommissioning phases.	To be estimated by Health and Safety officer.

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		Security patrols around the construction site.				
Increased energy demand	Energy pollution	11KV medium Voltage power supply for the facility implemented. Alternative sources of energy, e.g., solar and backup generator provided. Acquire clearance and permits from service providers. Conduct energy use audits. Employ energy saving methods and initiatives at the project site. Clean renewable energy sources adopted, i.e., solar. Backup generators installed. 66KV power substation constructed.	Energy saving initiatives in place.	Contractor and State department of Mining	Construction	200,000.00
Increased solid waste generation	Poor aesthetics and environmental pollution	Proper waste disposal methods in place. Waste disposal in government/NEMA designated areas. Proper solid waste segregation, collection, and disposal plan. Dispose all waste as per the waste management regulations.	Waste management schedule. Recycling of waste. Contractual documents of a licensed waste handler on site.	Contractor	Construction and decommissioning phases.	50,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		Contract a licensed waste handler to collect solid waste which cannot be reused on site. Appropriate disposal of hazardous waste, e.g., including facemasks. Routine check-ups and monitoring of the drainage systems to avoid leakages and blockages, etc.				
Increased effluent waste generation	Environmental contamination	Procure and install a wastewater treatment plant that treats effluent to NEMA discharge standards as per regulations Locate the plant appropriately to avoid foul smell during desludging intervals Reuse treated effluent for other purposes such as water gardens and greening. Ensure the treatment plant has sufficient redundancy capacity to forestall any overflow in case of mishap	Mobile latrines for the workers. Availability of waste water treatment plant at the facility.	Contractor	Construction and decommissioning phases.	60,000.00
Increased water demand		Harvest and store sufficient water. Reuse effluent treated water for gardening. Limit paved areas allow water percolation to recharge aquifers.	Water saving initiatives in place.	Contractor and State department of Mining	Construction phase	35,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		Acquire clearance and permits from service providers. Install water closets & fixtures with low volume cisterns and high pressure. Water meters shall determine the water consumption rate. Conduct regular water quality tests. Harvest and store rainwater.				
Increased insecurity	Increased crime rate	Fence/ cordon off the construction site. Ensure 24-hour security patrols by a professional security company. Install CCTV cameras Restricted site access.	Installed CCTV Reduced crime rate Frequency of security patrols	Contractor and State department of Mining	Construction phase	530,000.00
Traffic and congestion	Traffic snarl up due to increased vehicular movement.	Provide for acceleration and deacceleration lanes. Install the security check 20m off the road into the property. Motor vehicles and trucks should park inside the property. Planned deliveries to make sure they do not coincide with heavy traffic or peak times, etc.	Speed limit signage Acceleration and deceleration lanes	Contractor	Construction and decommissioning phases	150,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		Expand road network through creation of diversions. Provide traffic calming measures such as flat-topped speed bumps, road markings and signs. Provide adequate pedestrian facilities such as walkways and zebra crossings immediately adjacent to the property along the project road.				
HIV/AIDS & other Sexually Transmitted Infections (STIs)	Disruption of societal cultural and moral fabric	Conduct sensitization to the staff and community on drug abuse, irresponsible sexual behaviours, HIV and AIDS, stress management, and voluntary counselling and testing. Avail condom dispensers at the site to the construction staff and the latter occupants. Strengthen advocacy through awareness training in HIV/AIDS and other Sexually Transmitted Infections to the community members. Provide counselling and testing for HIV/AIDS victims. Prohibit smoking within the project site.	Community sensitization meetings are done. Voluntary counselling and testing centre within the workplace. No smoking signage erected. Presence of smoking zone.	Contractor and State department of Mining	Construction and decommissioning phases	50,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
Incidents and Accidents (project workers, road users, and passers-by)	Loss of life. Falling objects on pedestrians passing by the project site. Fire breaks out due to electrical faults during electric connections and use.	Proper signage and provision of security patrols (day and night). Use of reflector jackets by project workers and visitors. Regular training of workers on safety. Regular servicing and maintenance of project machinery and equipment, etc.	Accident occurrence registration. Maintenance and servicing schedule. Incidence register and report	Contractor and State department of Mining	Construction and decommissioning phases	150,000.00
Interruption of infrastructural services	Damage to utility services such as underground water pipes, aerial cables, electricity wires, fibre optic cables, etc.	Strict adherence to project designs. For any relocation on infrastructure services such as water pipes and Kenya Power and Lighting Company power lines, the proponent should contact the service technicians or relevant authority. Prior notification to the affected service consumers of the pending inconvenience.	Access to the infrastructural services without disruption.	Contractor and State department of Mining	Construction and decommissioning phases.	110,000.00
Changes to the ecosystem	Disturbance to the natural ecology of animals and plants.	Strict adherence to and use as minimal space as possible not to interfere in the ecological pattern of the project area. Muffle the generator set exhaust in order to minimise on noise pollution Strict adherence to project designs.	Minimal disturbance	Contractor and State department of Mining	Construction and decommissioning phases	40,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
Water pollution (underground water)	polluted underground water	Green buffer zones provided for surface runoff percolation and ground water recharge. An elaborate wastewater treatment plant provided.	Underground water quality test results	Contractor and State department of Mining	Construction and decommissioning phases.	30,000.00
Prostitution, drug abuse, theft	Degradation of area land use.	Increase opportunities to uncover employee theft Establish a policy that enables employees to report thefts and other crimes committed by co-workers without fear of exposure or reprisal. Security patrols by a private security firm to ensure no illegal businesses in the area. Illegal businesses activities will be discouraged in front of the property. Prohibit smoking within the project site. Peer intervention: employee alcohol education programs may prepare peers to suggest assistance to one another In addition to alcohol education programs, contractor also may offer health promotion programs,	Absence of non-accredited hawkers, *boda bodas*, among others in the area.	Contractor and State department of Mining	Construction and decommissioning phases.	12,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		which may motivate employees to alter their drinking behaviours Strict supervision of workers Contractor can adopt a workplace alcohol and drug/substance abuse policy that will reduce the loss of productivity and provide a safer work environment for all				
Operation phase						
Air pollution	Smoke generation from chimneys, and the back-up generator can lead to invisibility and health problems with the immediate residents	Regular air quality assessment tests to be undertaken with a baseline referral point. Regular service and maintenance of vehicles, mobile plants and machinery. Provide workers with appropriate personal protective equipment. Compact any loose soil and ensure dust minimization through watering. Locate exhaust at a dispersive area and away from domestic premises during design stage to avoid dark smoke during testing operation. Avoid no load test which generates dark smoke from incomplete combustion.	Complaints from the neighbourhood residents. Dark spots on the structures near the generator point.	State department of Mining	Operation and decommissioning phases	70,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		The suction hoods should adequately cover the furnace mouth and ensure that all fumes are trapped. The cooled emissions to be passed through series of filters which trap the air - borne particulates before going to scrubber The scrubber units should have alkaline solution spray to neutralize acidity if any in the fumes, strained through filters in the chimneys to remove solid particles before being released into the environment. Monitoring the quality of the scrub solution as well as avoiding accumulation of sludge in the scrubber tanks should be practiced ensuring efficiency of installed scrubbers. Stack emission sampling to be done frequently by NEMA licenced laboratories and proponent obtain emission licences annually.				

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
Noise and vibrations nuisance	Noise pollution from the back-up generator, cooling plant, vehicles, and office equipment.	Conduct noise assessment baseline study. Conduct regular noise level and vibration monitoring with their defects. Providing workers with personal protective equipment. Construction activities to be carried out between 8:00am-5:00pm. Install silencers to the generator. Carry out regular maintenance of the office equipment, vehicles and generator. Ensure the generator house is completely muffled to allow no more than 50DB of noise.	Complaints from the residents. Generator maintenance schedule. Cooling plant maintenance schedule.	State department of Mining	Operation phase	60,000.00
Increased insecurity	Increased crime rates	Fence/ cordon the construction site. Ensure 24-hour security patrols by a professional security company and police men. Install CCTV cameras	Cordoned construction site.	State department of Mining	Operation and decommissioning phase	37,000.00
Solida waste and E-waste production	Poor aesthetics and environmental pollution	Proper waste disposal methods in place. Waste disposal in government/ NEMA designated areas.	Waste management schedule. Recycling of waste.	State department of Mining	Construction and decommissioning phases.	90,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		Proper solid waste segregation, collection, and disposal plan. Contract a licensed waste handler to collect solid wastes which cannot be reused on site. The proponent and contractor to practice Extended Producer Responsibility (EPR) on all chemical purchased for use on the site to reduce pollution and waste produced. The proponent should take back of obsolete EED to manufactures for the purpose of recycling, reusing and reduction of e-waste.	Contractual documents of a licensed waste handler on site.			
Overpopulation (influx of people)	Human traffic	Controlled site access. Proper signage, i.e., no idling. Sensitization and awareness creation on site access. Engagement of a recruitment bureau to hire workers.	Low number of people at the project site and area.	State department of Mining	Operation and decommissioning phases	10,000.00
Visual impact						
Visual amenity	Environmental aesthetic	Minimize any detrimental impact upon the visual amenity of a locality by reducing prominence of development project infrastructure. Avoid obstruction of private views from the building line or principal	Avoids skyline positions. Project infrastructure does not intrude into identified important public views or	Contractor and State department of Mining	Construction, operation and decommissioning phases	280,000.00

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
		windows by project infrastructural facilities. Protect important public views such as vistas to significant public buildings, streetscapes and heritage areas.	measures are taken to minimize intrusion. Avoiding or minimizing obstruction of private views.			
Project aesthetics and visibility		Maintain the character of the surrounding by adopting appropriate roof colour. Ensure the height of buildings is consistent with neighbourhood. Project keeping low profile.	Project character in harmony with the neighbourhood character.	Contractor and State department of Mining	Construction, operation and decommissioning phases	
Residential Amenity		Protect residential amenity Project in harmony with the neighbourhood character.	Not establishing out of character infrastructures in residential areas unless a need to do otherwise is demonstrated.	Contractor and State department of Mining	Construction, operation and decommissioning phases	
Environmental Values		Protect threatened species and the habitats, ecological communities or places essential to their continuing existence. Protect flora and fauna, habitats and ecological communities. Protect areas identified as having significant natural values.	The proposed infrastructure does not: Adversely impact on identified threatened species. Adversely affect areas of significant natural values.	Contractor and State department of Mining	Construction, operation and decommissioning phases	

Environmental /social issue/ aspect	Anticipated environmental impact	Management/mitigation measure	Monitoring measure	Responsibility	Mitigation period	Cost estimates/ Per annum (KES)
			Uses best practice environmental management to minimize harm to the environment.			
Land Stability		Ensure that the development project infrastructure does not cause land instability.	Development project infrastructure: (Including specific access routes) does not cause erosion or cause land instability during construction and operation. Is not located in areas of known unstable land.	Contractor and State department of Mining	Construction and decommissioning phases	
Access		Ensure that the project activities do not impede movement of vehicular and other modes of transport.	The location of the project allows for adequate clearance for vehicular traffic and will not pose a danger or encumbrance to other land users or aircraft.	Contractor and State department of Mining	Construction, operation and decommissioning phases	
APPROXIMATE COST						**7,494,950.00**

8.5 Emergency Response Plan

Emergencies and disasters can occur any time without warning. These are prepared for proponents to be in good position to act to minimize panic and confusion when they occur. Emergency Response Plans (ERP) will have to be instituted throughout the project cycle. The following elements of a conventional emergency response plan are recommended as summarized in the table below.

Table 16: Proposed project emergency response plan

Component	Actions/Requirements	Responsibility
Potential Emergency	- Identification of all potential emergencies associated with the proposed project at the project site including fire, accidents & incidents, security, hazardous materials, and oil spills, among others.	- Contractor during construction and Decommissioning phases. - State department of Mining during operation phase.
Emergency Operations Coordinator (EOC)	- Designate a primary and secondary contact person	- Contractor and State department of Mining during all project phases.
Emergency contact Numbers	- Give & display contact for fire station, ambulance, police, hospitals and first aider on duty, including those of the Kenya Red Cross.	- Contractor and State department of Mining during all project phases.
Installation of emergency equipment	- Fire sensors and sprinklers. - Fire alarms. - Fire extinguishers. - Fire hose. - Panic alarm button. - Provision and enforcement of use of PPEs. - Emergency Communication equipment, such as Phone, radio calls & alarm bells.	- Contractor during construction and Decommissioning phases. - State department of Mining during operation phase.
Training in emergency response	- Regular training for emergency response.	- Contractor and State department of Mining during all project phases.
Trained in the use of emergency equipment	- Employees training in the use of emergency equipment.	- Contractor and State department of Mining during all project phases.
First Aid	- Provision of first aid kits. - First aid management training.	- Contractor and State department of Mining during all project phases.
Signage	- Fire sensors. - Signage, action poster, alarm bell/ panic button.	- Contractor and State department of Mining during all project phases.
Procedure for rescue and	- Evacuation plan. - Warning system.	- Contractor and State department of Mining during all project phases.

Component	Actions/Requirements	Responsibility
evacuation	- Assembly site. - Shelter in place plan.	
Emergency Response Plan review	- Annual Emergency Response Plan review.	- Contractor and State department of Mining during all project phases.

CHAPTER 9: PROJECT DECOMMISSIONING

9.1 Introduction

Decommissioning is the final disposal of the project and its associated materials at the expiry of the project lifespan. It involves winding up of the operational activities of a particular project and safe removal of all materials resulting from the decommissioning activities.

9.2 Purpose and Objectives of Decommissioning

It releases valuable assets and sites for alternative use, recycling and reuse of materials and the restoration of environmental amenity. It aims at achieving an endpoint that is sensible in technical, social and financial terms, that properly protects workers, the public and the environment as well as complying with the basic principles of sustainable development.

Table 17: Proposed decommissioning plan

Expected Negative Impacts	**Recommended Measures**	**Responsible Party**	**Time Frame**
Scrap materials and other debris (overburden soil, used internet and electrical cables, steel metals, reflector materials, etc.)	Use of an integrated solid waste management system i.e., through a hierarchy of options. Wastes generated as a result of facility decommissioning activities will be characterized in compliance with standard waste management procedures. The contractor will select NEMA approved disposal locations, and the county government based on the properties of the particular waste generated.	Contractor and State department of Mining	During decommissioning
	All the facility, machinery, equipment, structures and hand tools that will not be used for other purposes should be removed and reused or rather sold/given to scrap material dealers.	Contractor and State department of Mining	During decommissioning
	Where recycling/reuse of the machinery, equipment, structures and other waste materials is not possible the materials should be taken to NEMA approved dumpsites by a duly registered and licensed waste transporter.	Contractor and State department of Mining	During decommissioning

Expected Negative Impacts	Recommended Measures	Responsible Party	Time Frame
Vegetation disturbance. Land deformation: soil erosion, drainage problems.	Implement an appropriate re-vegetation programme to restore the site to its near original status. During the re-vegetation period, appropriate surface water runoff controls will be taken to prevent surface erosion. Monitoring and inspection of the area for indications of erosion will be conducted and appropriate measures taken to correct any occurrences. Fencing and signs restricting access will be posted to minimize disturbance to newly vegetated areas.	Contractor and State department of Mining	During decommissioning

CHAPTER 10: GRIEVANCE REDRESS MECHANISMS

10.1 Need for Grievance Redress Mechanisms

The objective of the Grievance Redress Mechanism (GRM) is to support genuine claimants to resolve their problems through mutual understanding and a consensus reaching process with the relevant parties. This is in addition to the available legal institutions for resolving unsatisfied appeals from the public against the disagreeable decisions with a project focus approach.

Development projects affect people in different ways which may relate to social, economic, cultural, and environmental matters. These problems are very complex due to the drastic change of project affected persons (PAPs) livelihoods. Some problems may emerge due to construction related activities like site clearing, excavation, and compaction. Such issues cause grievances among the public who are adversely affected by the project. Preventive measures need to be taken to minimise grievances rather than going through a redress system. One main reason for having a grievance redress mechanism is to resolve many communal and public issues at site and avoid unnecessary delays in project implementation due to public criticisms and protests. One of the key policy objectives is making all affected persons aware of processes that are easily accessible and immediately responsive for grievance redress.

Establishment of the Grievance Management will allow the project proponent to receive and address specific concerns raised by project affected persons (PAPs) or members of host communities in a timely manner, including a recourse mechanism designed to resolve disputes in an impartial approach. Also, the grievance mechanism is another form of promoting participation and consultations. The requirement for a grievance redress mechanism is consistent with the Kenya laws which recognise the need for a mechanism for the PAPs to air their grievances in local government structures, customary authorities, and courts of law. It is on that account that this chapter proposes a grievance mechanisms and management procedures to resolve grievances, concerns and issues related to the project.

Basically, GRMs are designed as an avenue for making enquiries, inviting, and documenting suggestions, and increasing community participation in a project. To the extent that projects are able to achieve success on these dimensions, particularly, an effective GRM mechanism can be useful in different ways. This include but not limited to:

- Generating public and stakeholder awareness about the project and its objectives.
- Increasing stakeholder involvement in the project.
- Improving project outcomes: through timely resolution of issues and problems, GRMs can contribute to timely achievement of project objectives and enable timely project completion.
- Providing feedback to different levels of project performance i.e., providing project staff with practical suggestions/feedback.
- Acting as an early warning mechanism, GRMs can identify and resolve implementation problems in a timely and cost-effective manner: They help teams catch problems before they become more serious and widespread, before they escalate, thereby preserving project funds and its reputation, and avoiding time-consuming disputes. Therefore, acting as an effective risk management tool.
- Building community-project relations, through creating and maintaining trust with affected persons and community stakeholders, thus enhancing the project's legitimacy among stakeholders.
- Allowing staff involved in project implementation to be more accountable, transparent, and responsive to PAPs.
- Deterring or curbing fraud and corruption.
- Assessing the effectiveness of internal organisational processes but also improving the operational processes and performance of an organisation.

10.2 Aims, Objectives, Key Principles, and Lifespan

- Aim:- The goal of the grievance redress mechanism is to reduce the risks and costs that are associated with unresolved grievances. These costs can be litigation and/or administrative costs.
- Objective:- The objective of the Grievance Management Mechanism (GMM) will be to achieve speedy resolution of grievances to the satisfaction of the aggrieved person(s) and the project proponent. The satisfaction will depend on adherence to basic grievance resolution principles.

10.3 Key Principles

The United Nations Guiding Principles (UNGP) on Business and Human Rights lists several "effectiveness criteria" for the successful implementation of a grievance mechanism. The UNGP states that grievance mechanism should always be:

- Legitimate:- the mechanism must have a clear transparent and sufficiently independent governance structure to ensure that no party to a grievance process can interfere with the fair conduct of that process.
- Accessible:- the mechanism must be publicised to stakeholders who may wish to access it and provide adequate assistance for aggrieved parties who may face barriers to access, including language, literacy, awareness, finance, distance, or fear of reprisal.
- Predictable:- the mechanism must provide a clear and known procedure, with time frames for each stage; clarity on the types of process and outcome it can (and cannot) offer and means of monitoring the implementation of any outcome.
- Equitable:- the mechanism must ensure that aggrieved stakeholders have reasonable access to sources of information, advice, and expertise necessary to engage in a grievance process on fair and equitable terms.
- Rights-compatible:- the mechanism must ensure that its outcomes and remedies accord with internationally recognised human rights standards.
- Transparent:- the mechanism must provide sufficient transparency of process and outcome to meet the public interest concerns at stake and should presume transparency wherever possible. Furthermore, the process should be a source of continuous learning, drawing on relevant measures to identify lessons for improving the mechanism and preventing future grievances and harms; and based on engagement and dialogue – consulting the stakeholder groups for whose use they are intended on their design and performance, and focusing on dialogue as the means to address and resolve grievances.
- Duration:- The lifespan of this proposed grievance management mechanism will be the duration of the project implementation including the construction phase.

10.4 Grievance Redress Committee

The Grievance Redress Mechanism will provide a way of providing an effective avenue for expressing concerns and achieving remedies for the communities, promote a mutual constructive

interaction and enhance the achievement of project development objectives. GRMs are very important for development projects where ongoing risks or adverse impacts are anticipated. They serve as a way to prevent and address community concerns, reduce risk, and assist larger processes that create positive social change. Open dialogue and collaborative grievance resolution simply represent good business practice both in managing for social and environmental risks and in furthering project and community development objectives.

Considering the nature and extent of works on the project, grievances/issues/concerns are expected to arise from the following:

- Conflicts among neighbours and families.
- Complaints on workers behaviour or conduct, specially towards women, young girls, and children.
- Disputed ownership of an affected asset particularly where documentation is not reliable.
- Rejection of a compensation award considered not adequate and representative of market value.
- Handling of cultural issues where there are no clearly agreed precedents including alien cultural depictions from non-local workers.

A local Grievance Redress Committee (GRC) will be established, consisting of representatives from the community, representative of the project proponent, local administration, village/community elders, influential personalities other than the aggrieved persons, and also the church administration. The GRC will be headed by Ivonda administration, led by the area chief. Grievances should be settled amicably whenever possible. However, if the resolution of a case requires additional payment or any form of relocation of resources, the report shall be sent to the appropriate administrative executive for consideration.

If the administrator agrees to the recommendation, he/she shall instruct the project implementation unit to implement the amended provision. On the other hand, if complainant is not satisfied by the recommendation of the GRC, the aggrieved party may be advised to pursue the case in a formal court system.

Under the proposed project, a set of forms are developed to be used for recording grievances and to the actions taken are prepared, as listed below (Note: shall need to be translated in local language). The specific forms to manage grievances are attached in Appendix VIII.

1. Grievance Statement Form
2. Grievance Receipt Acknowledgement Form
3. Grievance Investigation Form
4. Grievance Investigation Outcome Form

10.5 Outline of the Grievance Redress Mechanism

The grievance mechanism applies to all complaints related to the Kakamega Gold Refinery Plant project activities as outlined in the steps below:

Step I: Receive and Record Compliant (using the Grievance Receipt Standard Form). The grievance shall also be registered in a ledger/ logbook at the project site.

Step II: Review Complaint and Allocate Actions (complaints are screened, and actions then be allocated to investigate and resolve grievance or refer matter to next level).

Step III: Notify Complainant of Proposed Resolution (notify the complainant that the complaint has been received, how it is being dealt with, by whom and an approximate estimate of how long the process might take (this must happen within 9 days).

Step IV: Act and Update Complainant (undertake the proposed actions for resolution and update complainant when it is complete).

Step V: Close out and Lessons Learnt (occurs when both parties are happy with proposed solution).

Step VI: Update Project Grievance Records (using standard forms, grievances will be maintained and stored including for information for any outstanding actions)

Step VII: Reporting (to concerned/ defined parties).

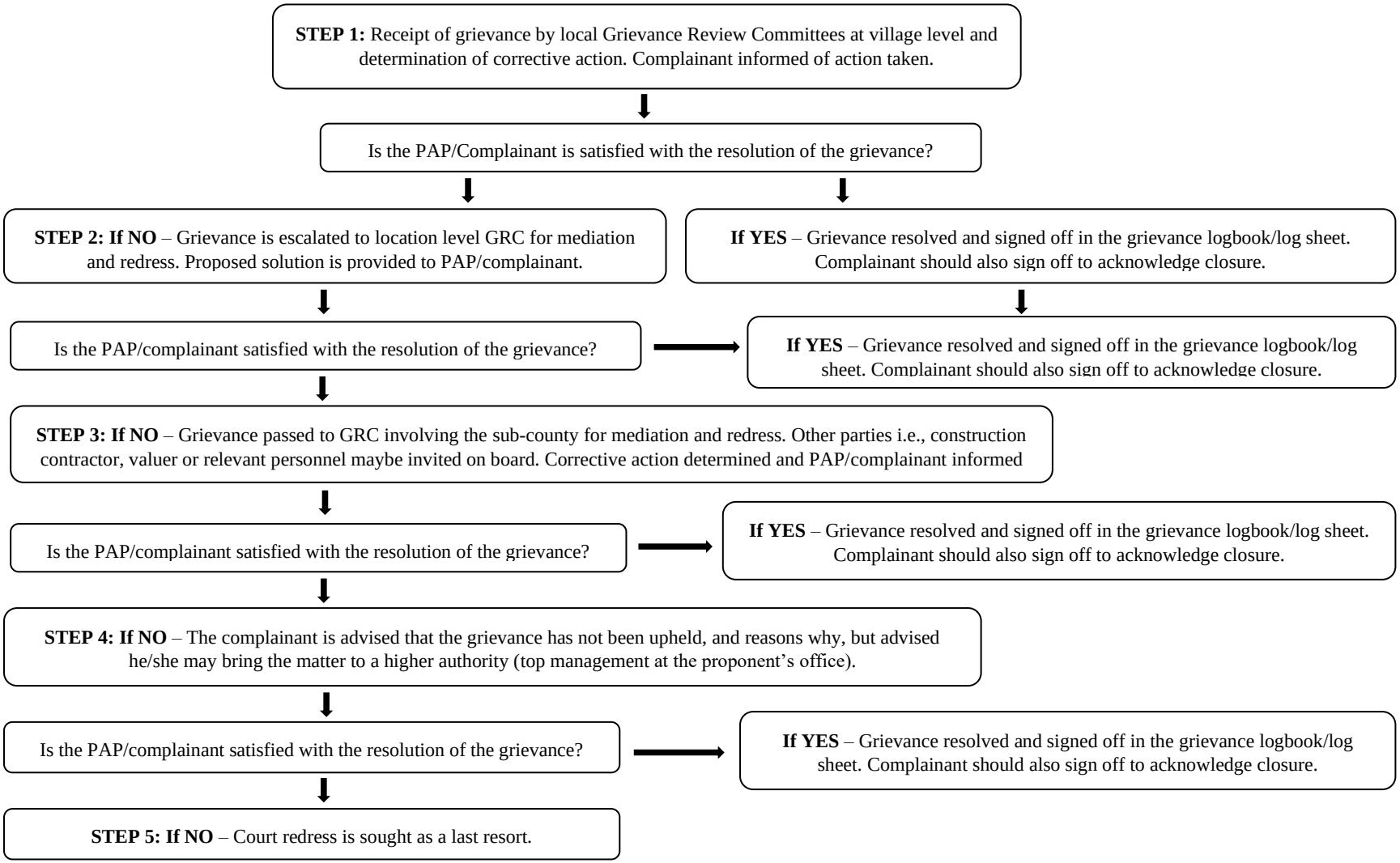
10.6 Evaluation of the Grievance Redress Mechanisms

The effectiveness of the GRM will be evaluated during the periodical performance reporting and as part of the post project construction evaluations. Grievance issues by type and how they were resolved: -

- Total cases received, and total cases justified.
- Total cases received, total cases justified, total non-justified cases, including the subject matter for all complaints, and an explanation for non-justified complaints.
- Total cases resolved at various levels including the type of agreement reached.

- Total cases referred to the legal system/courts of law, including a clarification on who initiated (local leaders, PAPs, or proponent) the referral and the subject matter.
- Number of PAPs that have used the grievance redress procedure.
- Integration of GRM into the overall project management.

Figure 7: Flowchart of grievance and dispute management



10.7 Operational Aspect of GRM and GRC

The ownership of the Grievance Redress Mechanisms and Grievance Redress Committee goes to the proponent due to their ability and resources to solve such particular problems. It is recommended for the proponent to employ consultants with experience to implement a very effective GRM.

For effective functioning of GRC, it is necessary to develop awareness among stakeholders of the project on GRM and GRC. The general public, public officers, social organisations, contractors among others should be knowledgeable in GRM and GRC in order to successfully implement the GRM. The project administration and implementation office of the proponent can play a major role in introducing GRM and GRC for the PAPs. It can disseminate the details to the relevant GRC for the PAPs.

The GRM has to be given wide publicity among stakeholder groups such as PAPs, the affected community, relevant government agencies, and civil society organisations. Effective awareness of the GRM process makes people better understand their options, depending on the types of complaints. Nonetheless, measures should also be taken to encourage stakeholders not to submit false claims. Criteria for eligibility need to be communicated and also awareness campaigns should be launched to give publicity to the roles and functions of the GRM.

Awareness should include the following matters and facts:

- Scope of the project and planned construction phases.
- Types of GRMs available, purposes for which the different GRMs can be accessed, e.g., construction-related grievances, grievances related to physical and economic displacement.
- Types of grievances acceptable and those not acceptable to the GRM.
- Eligibility to access the GRM i.e., is open for all.
- There is no retribution for complainants i.e., they are not punished.
- The project based GRM is cost free: there are no financial charges to access or have the committees hear a dispute.
- How complaints can be reported to those GRMs and to whom, e.g., phone, postal and email addresses, and websites of the GRM as well as information that should be included in a complaint.

- Procedures and time frames for initiating and concluding the grievance redress process, boundaries, and limits of GRM in handling grievances, and roles of the proponent.
- A variety of methods can be adopted for communicating information to the relevant stakeholders. These methods could include display of posters in public places such as in local government offices (for example at the chief's office), project offices, project websites, health centres within the area among others.
- Confidentiality can be assured where needed.
- There exist mechanisms to escalate an issue if one committee is not able to address it satisfactorily.
- The project welcomes suggestions, recommendations, and grievances as they help improve the project's policies and systems.
- Any system to appeal against the decision of GRC.

Simultaneously, an effective awareness programme should be arranged to educate the PAPs and the community on the following:

- Members of GRC and its location.
- Technique and procedure of making a complaint or reporting the grievance.
- Taking part in the GRC meeting (i.e., are any companions of the complainant allowed).
- The timeline and steps in grievance resolution.
- Documents required and evidence in support of the complaint.

This information has to be presented in a simple brochure as the basic authentic document on GRM. This is a straight forward public leaflet giving exact information on GRM and GRCs with its scope and working arrangements. This brochure helps avoid misconceptions, over expectations and ambiguities on the GRM and GRCs. However, raising public awareness or community empowerment cannot be achieved by a onetime intervention or a simple document, as it has to go through a complete process with a series of interventions mutually supporting each other over a long period.

10.8 Capacity Building of the Grievance Redress Committees

The proponent will ensure the GRC undergo training e.g., on best practices in grievance redress, monitoring, and evaluation to enable them to become more effective in their work. The GRC members will also need to be oriented to the grievance management system outlined in this report.

The capacities of the GRC members will also need to be built around issues of conflict identification, conflict information analysis and conflict resolution. In addition, this exercise shall include detailed terms of reference for the committees.

10.9 Response to Grievances and Documentation

Responses to grievance will be communicated through the following channels:

- The same channel the complaint was submitted.
- Response to grievances should be handled in timely manner thereby conveying genuine interests and understanding of the worries put forward by the community.
- The project office should keep a record of complaints and results for future reference.

At all levels, documentation will be ensured, including the grievance registers, grievance forms. Minutes will be taken for every meeting and signed by the relevant parties.

CHAPTER 11: GENERAL OCCUPATIONAL SAFETY AND HEALTH TIPS

11.1 Overview

This chapter covers various aspects of occupational safety, health, and security at the proposed project site including personal protective equipment, safety measures, and what to do in case of needlestick injury.

11.2 Personal Protective Equipment

The operator, construction staff, services and maintenance staff among other personnel should always have adequate personal protective equipment (PPE). This equipment must be always worn when working within the proposed project. Standard PPE generally includes:

- Gloves: Always wear gloves when handling hazardous materials and devices.
- Puncture-resistant gloves: should be used when handling sharp equipment/devices or bags with unknown contents.
- Boots: Safety boots or leather shoes provide extra protection to the feet from injury by sharps or heavy items that may accidentally fall. Boots must be kept clean.
- Overalls: Overalls should be always worn.
- Aprons: standard aprons should be worn when operating in certain areas and machines/equipment.
- Goggles: Clear, heat-resistant goggles can protect the eyes from accidental splashes or other injury.
- Mouth respirators.
- Helmet: Helmets protect the head from injury and should be always worn during the entire construction and operational phases.

11.3 Occupational Safety and Health

The general Occupational Safety and Health (OSH) requirements are as follows:

- There shall be a National OSH policy approved by the relevant authorities at workplaces.
- Occupational diseases, work accidents and near misses occurred at workplaces shall be recorded and reported to relevant authorities.
- Appropriate work equipment shall be provided for employees to conduct their work.

- Health surveillance of employees shall be done in certain periods according to the nature of the work.
- Floors where appropriate shall be made of flat even and non-slip material.
- Proper conditions shall be provided to vulnerable employees (i.e., disabled, young employees, pregnant among others) in workplaces.
- Appropriate signs to remind and inform employees on hazards and steps to take shall be made available at workplaces.
- Necessary training shall be provided on the use of work equipment and PPEs.
- A professional staff shall be designated to be responsible for health and safety at the workplace as well as their names should be displayed in accessible places.
- All information related to work hazards and preventive measures as well as emergency rules and exit plans in case of a serious incident shall be displayed in accessible places.
- First aid facilities such as first aid boxes and first aid rooms, where appropriate, shall be provided. All workplaces shall have trained enough first aiders, according to the number of employees in the workplace, and ensure that medical teams are available at the workplace whenever needed.
- Information, dialogue and balanced participation on safety and health at work must be developed between the employer and workers and or their representatives by means of appropriate procedures and instruments, in accordance with national laws and/ or practices.
- Undertake periodic inspection of work equipment by qualified professionals and/or companies.

Occupational Safety and Health requirements for the proponent:

- The proponent/contractor/employer shall have liability to ensure the safety and health of employees in every aspect related to the proposed development. In this frame, the proponent/contractor/employer has the responsibility for hazard identification, prevent occupational risks, provide necessary organisation, tools and adjustment of health and safety measures according to changing circumstances and aim to improve existing situations.
- The proponent/contractor/employer must provide a platform for workers and employers to sit together and discuss all issue on OSH at workplace.
- Outcomes of the health surveillance shall not be used to the detriment or against the employee’s employment status.

- Collective preventive measures shall be taken by employers/proponent/contractor, as a matter of priority over individual preventive measures.
- Workers shall be granted the right to leave the workplace in the event of extreme danger or anything that may threaten his life or health.

Occupational Safety and Health requirements for employees/workers:

- The employees' suitability regarding the work shall be taken into consideration.
- The employees shall be provided with Personal Protective Equipment (PPE) appropriate to the nature of the work.
- The employees shall be required to act complying with training and instructions given by employer.
- Compensatory mechanisms shall be in place at the national level for employees injured or suffering from occupational diseases.

11.4 Risk Assessment

Risk assessment is a process performed to identify the hazards which may exist in a workplace, to analyse and grade the factors which cause the hazards turn into risks and to determine the precautions to reduce the risk that shall be taken. Risk assessment is done by the employers, or he shall provide it to be done by an expert. Risk assessment shall be done with cooperation of employees/workers and other experts and shall be revised and updated on a regular basis. The risk assessment shall be both qualitative and quantitative.

The hierarchy that followed under the scope of risk assessment is:

- The risks at workplace shall be abstained first and they shall be eliminated at its source.
- If elimination is not possible, substitution of dangerous one with less dangerous one shall be done.
- If substitution is not possible, engineering, and administrative control measures shall be applied.
- Appropriate PPE shall be used, as last resort, to minimize adverse effects of the risks.

11.5 Occupational Safety and Health Training

The employer/proponent/contractor shall provide to the employees both fundamental OSH training and special vocational training appropriate to the nature of the work being carried out (free of charge to the employees). In these training:

- Training need analysis should be performed according to the need before performing the job. Result of risk assessment may be used in this analysis.
- Knowledge, skills, behaviours, and attitudes of employees/workers on occupational safety and health issues shall be borne in mind.
- The inadequacies of the trainees shall be taken into consideration while determining the subjects of the training program for an efficient training.
- The training shall be assessed and evaluated for its effectiveness and modification to the modules may be needed.
- Retraining is needed if the process, substance used, procedure or location of the workplace changed, the training shall be repeated.

11.6 Physical Factors

Risk hierarchy shall primarily be applied in workplaces. Besides, the proponent/ contractor/ employer shall take the precautions as follows:

- Machines or work benches shall be maintained at regular intervals.
- Employees/workers exposed to physical risks at workplaces shall be trained and information resulting from these risks should be communicated. The training shall include in particular:
    - The nature of such risks.
    - The measures taken to eliminate or reduce to a minimum the risks, including the circumstances in which the measures apply.
    - The exposure limit values of national legislation.
    - The correct use of PPEs.
    - Why and how to detect and report symptoms of health effects of physical risk factors exposure.
    - The circumstances in which employees are entitled to health surveillance and the purpose of health surveillance.

Besides the general liabilities given above, the employer shall take further precautions to eliminate or minimise physical risk factors which can be examined under seven headings as follows:

11.6.1 Noise

Minimum requirements for the employees to be protected from safety and health risks especially from those related to noise exposure are given as follows:

- To prevent the sound from propagating in the air sound-absorbing materials shall be used to the extent of facilities in the workplace.
- Where applicable, the distance between the noise source and the person exposed shall be increased.
- Noisy machinery/equipment/tools shall be enclosed as far as practically reasonable.
- Proper maintenance of machines and equipment shall be done on a regular basis.
- Hearing protection device shall be used to minimise adverse effects of the noise.

11.6.2 Vibration

The contractor/employer fulfils the minimum requirements for the employees to get protected from safety and health risks that may be caused by exposure to mechanical vibration. In this context proper working schedule, using less vibration equipment and adequate rest shall be planned and applied.

11.6.3 Thermal Comfort

The employer/contractor/proponent is to provide workplace with a good thermal comfort condition. In this context:

- Thermal comfort conditions in the workplace shall be in a way that would not disturb employees' tasks performed and would not affect their physical and psychological situation.
- Devices used for heating and cooling shall be placed in a way that would not disturb the employees and would not create risk of accidents. They shall be maintained and checked regularly.
- Regarding the nature of the work, in case of working continuously in extremely hot or cold environments and windows and roof lights, to avoid the negative effects of sunlight that should be provided.

- Adequate exchange of air appropriate to the task and environmental conditions shall be provided.

11.6.4 Illumination

The employer/contractor/proponent shall provide a sufficient illumination for employees to perform the job safely. In this context, workplaces shall be illuminated sufficiently by day light. In cases which beneficiation from day light is not possible or during night work, artificial light shall be provided for adequate lighting.

11.6.5 Dust

The employer/proponent/contractor shall provide a dust-free environment, to extent which is practicably applicable, for the employees to get protected from safety and health risks. In this context:

- Water shall be used at places where dust is released. (Aqueous working-wet method).
- Proper ventilation and control equipment shall be provided.
- Appropriate PPE shall be provided, and employer shall ensure proper use of PPE.
- The exposure of employees shall be monitored and documented regularly.
- Chambers of high air pressure shall be placed in between dust releasing and dust free parts; passage of dust particles to dust free part shall be avoided.
- Pre-employment and periodical medical examination of employees shall be done.

11.6.6 Ventilation

Pertaining to gases, dust and odour existing in the work environment, adequate ventilation shall be provided. The ambient air shall be changed according to nature of the work periodically.

For the environments where works emitting dust, mist and fume are carried out, chimneys and air vents of capability to extract those shall be provided and in cases where these precautions are not sufficient, other technical precautions, according to the nature of the work done, shall be taken.

At the workplaces where suffocating, toxic or irritating gas and smoke arising, ventilation installation shall be designed to protect the health of employees and masks and other protective equipment, according to the nature of the work done, shall be provided.

11.6.7 Radiation

The employer shall protect employees from the adverse effects of radiation. In this context:

- All workplaces working with radioactive substances shall be labelled as "Attention-Radioactive Substance".
- All equipment containing radioactive materials shall be labelled with the "radiation" symbol.
- Workplaces working with radioactive substances shall be adequately ventilated and shielded.
- Detailed procedures related to work with radioactive substances shall be prepared and available at the workplace.
- Radioactive wastes shall be collected with impermeable waste collectors and kept in lockable cabinets/closets or rooms.
- Only authorized stuff is allowed to work with radioactive substances shall access to the locked cabinets or rooms.
- All employees working with radiation and radioactive substances shall be provided with appropriate radiation monitors, appropriate PPE as well as undergo regular periodic medical examinations.

11.7 Chemical Factors

Working with chemical substances, the employer shall arrange a procedure or precaution that will minimise the exposure of chemical to the employees:

- Keeping the number of employees exposed, or likely to be exposed, to minimum number as possible.
- Labelling the chemicals according to national and international standards and/or Safety Data Sheets (SDS) and informing the employees on chemical hazards through marking the chemical substances.
- Training employees on the use of the available information on SDS, occupational safety practices, and appropriate use of PPE's.
- Providing emergency apparatus in cases of accidental exposure.

The employer/contractor/proponent shall also ensure that employees who are exposed to chemical risk factors at work at or above the lower exposure action values receive information and training relating to risks resulting from the exposure. The training shall include in particular:

- Emergency arrangements,
- The results of the risk assessment,
- The hazardous chemical agents present at the workplace with access to SDSs,
- Training on the appropriate precautions and on the personal and collective protection measures that are to be taken.

The employer shall determine whether any hazardous chemical agents are present at the workplace. If so, the risks of affecting safety and health of the employees due to presence of those chemical agents shall be defined by taking into consideration the following:

- Hazardous properties of the chemicals.
- Information on safety and health that shall be provided by the supplier.
- The level, type, and duration of exposure.
- The circumstances of work with such agents, including their amount.
- Any occupational exposure limit values or biological limit values given in national legislation.
- The effect of preventive measures taken or to be taken.
- If it appears that the use of chemical in the process may risk injury to the health of the employee, the employer shall provide health surveillance.

11.7.1 Fire and Explosions

To avoid, control and properly manage fire and explosions resulting from ignition of flammable substances such as chemicals or gases:

- Flammables substance or material shall be stored away from ignition sources, inlets, exits and ventilation systems.
- Workplace environment shall be equipped with enough appropriate fire extinguishing devices.
- Warning signs shall be placed at zones of fire risk.
- Employees shall be trained on working with flammable substances and fire response.

11.7 Biological Factors

Biological factors are microorganisms and cell culture which may cause any infection, allergy, or poisoning, including ones that are genetically modified.

To avoid and reduce the risks caused by biological factors, use of harmful biological agents shall be abstained, and these harmful agents shall be substituted by less dangerous agents. Where this

substitution is not possible, required precautions shall be taken to keep the risk of exposure as low as possible.

11.8 Ergonomics

Mental and/or physical overexertion, manual handling of heavy weights, poor postures while performing any task, repetitive movements for prolonged periods can be considered to exemplify such ergonomic factors. To eliminate and/or alleviate risks due to ergonomic factors:

- Workplace shall be ergonomically designed about appropriate anthropometric measurements for current and prospective employees.
- By providing workstations fulfilling the requirements of the tasks performed, poor postures shall be avoided, and remedial actions shall be taken. Adjustable workstations, where possible and practicable, shall be provided.
- Work organization shall be established in such a way to eliminate the need of manual handling of heavy materials, or to reduce it as much as possible.
- Proper tools and mechanical assists that reduce manual exertions and holding times and improve postures shall be employed.
- Rest breaks of sufficient length for employees shall be allowed during work hours.
- Job rotation shall be conducted especially for tasks that require repetitive movements within constant postures or manual handling of heavy weights.

11.9 Machinery and Hand Tools

11.9.1 Machinery

The employer shall take the measures necessary to ensure that the work equipment, made available to employees or self-employed persons at the workplace is suitable for the work to be carried out or properly adapted for that purpose and may be used by employees or self-employed persons, without impairment to their safety or health. Rules to be followed while using machinery:

- Machinery shall be operated for intended purpose.
- The operator shall get training on the use of machinery and be informed of safety measures and safe work practices.
- Emergency stop button of machine and easily access during emergency shall be provided. Operator shall be informed on how and when to use the button.

- Work equipment carrying the risk of flying or falling object shall be equipped with suitable safety devices to eliminate those risks.
- Maximum load of lifting equipment shall be visibly marked.
- Appropriate work method shall be selected using suitable lifting devices pertinent to type, shape and other physical features of load that shall be lifted by lifting equipment.
- All reciprocating, rotating, and transverse moving parts shall be covered with appropriate machine guards.
- Electrically powered machines shall be grounded.
- Machines releasing dust, gas, vapor shall be equipped with suitable ventilation systems.
- Repair, maintenance, and cleaning shall not be carried out unless the machine is stopped.
- Work done with machine shall not expose the employee to vibration above the determined limit value.
- Only operators shall be allowed to enter operator cabins in all types of work equipment.
- Periodic inspection of machines shall be provided.

11.9.2 Hand tools

Hand tools include a wide variety of non-powered devices such as wrenches, pliers, hammers, and screwdrivers. Training on proper use of hand tools should be provided to employees. These tools may seem harmless, but they are known as the cause of many injuries.

Rules to be followed while using a hand tool:

- Right type and size of tool for the job shall be used.
- Any work shall not be done with greasy or oily hands.
- Sharp edged and pointed tools shall be handled with care.
- All small and short work shall be secured with a vice or clamp.
- Tools which are loose or cracked shall not be used.
- File shall not be used without a handle.
- Tools shall not be used for jobs they were not meant for.

11.10 Safe Working at Height

Working at height is defined as any job performed at an elevation difference and where injury and loss of life due to falling are possible. Only trained employee is permitted to work at height. While working at height.

- Safety of employees shall be primarily ensured by taking collective protection measures such as platforms, scaffoldings, safety nets, air bags, safe guardrails.
- Personal protective fall prevention measures such as safety harness and safety net which are appropriate to the nature of works being performed shall be provided.
- Measures shall be taken to prevent employees falling from openings on the floor and openings between vertical structural components.
- Guardrails to be used shall include a top rail, mid rail, or other side protection elements to provide same protection and a toe board to prevent materials from falling. The platform decking should be covered completely.

11.11 Emergency

Provisions that shall be considered in case of an emergency are:

- Probable emergencies shall be identified by evaluating emergencies which may affect employees and work environment (natural disasters, fire, explosion, sabotage, food poisoning, other emergencies identified because of risk assessment etc.) in advance. In determining these emergencies, working environment, materials used, working equipment and environmental conditions shall be kept in mind.
- Measures preventing and restricting the negative effects of emergencies shall be taken.
- Emergency drills shall be conducted periodically for raising preparedness to emergencies.
- An emergency action plan that includes operations, processes, information, and practice-oriented actions in emergencies shall be established. In this plan:
    - Probable emergencies.
    - Preventive and restrictive measures shall be taken.
    - Emergency response methods.
    - Evacuation plans that are prepared to be hung on different locations in the workplace.
    - Emergency teams and drill forms shall be involved.

- Emergency action plan shall be revised taking into consideration of results of emergency drills and emerging deficiencies during routine work. Even if there are no changes and obligations, the emergency action plan shall be updated periodically.
- Escape routes and doors shall be arranged properly. Evacuation shall be enabled smoothly in possible emergencies with the aid of marking and lighting. All evacuation routes and exits shall not be obstructed and exits tested for proper functioning on a regular basis.
- Necessary arrangements that provide communication with other agencies especially about first aid, emergency medical intervention, rescue and firefighting shall be made.
- Alarm and detection systems, fire extinguishing systems, fire extinguishers and other emergency equipment shall always be available. Equipment shall be visible and easily accessible.
- To respond to emergencies, enough employees which are equipped and trained in prevention, protection, emergency drill, firefighting, first aid etc. shall be assigned considering the size of enterprise and its special hazards, type of work, number of employees and considering other people in the workplace. The name of these trained personnel shall be displayed prominently.

11.12 Personal Protective Equipment

PPE include all protective devices, tools and materials used by the employees and manufactured to protect the employees from risks arising from the work being conducted affecting safety and health. Proper PPE shall be provided to employees' according to nature of work. Training should be given on proper use and maintenance of PPE. All PPEs shall:

- Prevent risks without creating additional risks.
- Be suitable for workplace conditions.
- Comply with ergonomic requirements and health status of the employees.
- Be a suitable size and fit and reasonably comfortable for the person wearing it.
- Be provided and maintain for fit for service.

CHAPTER 12: CLIMATE CHANGE RISKS AND VULNERABILITY ASSESSMENT

12.1 Overview

Climate change is impacting our world with increasing severity and frequency, and the need for resilience in our built environment has never been more critical. Disaster preparedness and recovery is also key in building resilience. Many green building ratings recognized worldwide eg Leadership in Energy and Environmental Design (LEED) which is the rating for this project focus on sustainable and environmentally responsible building practices, and resilience for the future projected hazards. This enables the project design team to promote comprehensive assessment of; observing projected future natural hazards and creating a resilient strategy to avoid disaster in case the hazard occurs.

According to the National Oceanic and Atmospheric Administration, climate resilience is defined as "the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.

The assessment considers that the proposed Kakamega Gold Refinery Master Plan project will be designed to be resilient to impacts arising from current weather events and climatic conditions. If the buildings constructed will be climate resilient, they will not just withstand natural disasters, they will also be able to recover more quickly from adverse events and provide a safe haven for occupants, support business continuity and reduce the strain on emergency services.

Climate change risks encompass the potential adverse consequences resulting from alterations in earth's climate patterns, largely attributed to human activities. These risks manifest in various forms, including extreme weather events, floods, shifts in weather patterns, water scarcity, and extreme temperatures, among others. Such risks introduce vulnerabilities and obstacles to development initiatives.

The construction activities can amplify climate change vulnerability in several ways, both during the building phase and throughout the lifetime of the development. The processes involved in construction, coupled with the changes to the natural environment brought about by large-scale projects, can exacerbate the risks posed by climate change.

Globally, economic progress faces persistent threats from climate pattern shifts. Moreover, the nature and scale of development endeavours can influence the susceptibility of communities to

climate change impacts. Consequently, addressing these challenges demands the integration of climate change considerations into development policies and projects.

Therefore, it becomes imperative to incorporate climate change resilience and adaptation measures into the Environmental and Social Impact Assessment process of projects. By doing so, stakeholders can mitigate adverse climate impacts and promote sustainable development practices that safeguard both environmental integrity and societal well-being.

The proposed development has the potential to impact and be impacted by a changing climate during construction and operation; however, mitigation measures are in place to reduce these risks.

An understanding of the likelihood of the hazards occurring is needed to identify the risk to the proposed Kakamega Gold Refinery from climate change. The risk and resilience assessment therefore will consider the likelihood of a hazard occurring that could result in an impact on the assets associated with the proposed project locality. In addition, the risk to the infrastructures will depend on the severity of the consequence of the impact, and the vulnerability of the asset itself. The definitions of these terms can therefore be summarized as follows:

- **Hazard** means the potential to cause an impact.
- **Risk** means the likelihood of impact occurring multiplied by consequence of impact of hazard.
- **Vulnerability** means the degree to which infrastructure or assets are susceptible to adverse impacts and is influenced by sensitivity, adaptive capacity and magnitude of impact.
- **Resilience** means the capacity to prevent, withstand, respond to, and recover from a disruption.

In this climate resilience assessment chapter, the aim is to identify the risks/hazards observed before or projected to occur within the project site, identify the climate change resilient options to incorporate during the design and construction stage and recommend them to the project design team and also give the proponent team who will be among the occupants during the operation stage of the project the emergency preparedness tips in the event the hazard occurs.

12.2 Principals of Climate Resilience

The principals that have guided this assessment in order to strengthen its implementation into the Kakamega Gold Refinery Master Plan and other future projects within the Kakamega South Sub-County.

1. **Proactive**. The assessment shows the solutions to implement that anticipate and address climate threats and impacts related to the project before damages occur. the team will prioritize activities and investments that need to be made in order to prevent the anticipated risks.
2. **Whole-System**- the assessment and resilience options will be implemented in an integrative way. This will ensure that increasing the building resilience of one disaster e.g fire will not affect the complete climate resilience implementation of the other disaster.
3. **Equitable**: The climate resilience solutions will not just be stated but will be implemented to detail by the design team and the contractor during the construction phase to help respond to future needs of disaster prevention and protection of the identified risks.
4. **Collaborative and Inclusive**: The climate resilience solutions are selected having in mind that the campus has employees living with disabilities. Their need to escape in case of a disaster within the buildings will be put into considerations without excluding them.
5. **Durable:** The climate resilience solutions for the project will serve current and future needs so the systems that will be put and the plans that will be developed will envision many years ahead for durability and avoiding financial resource losses that might be needed to replace them.

12.3 Master Plan Climate Resilience Action

The proposed Kakamega Gold Refinery climate resilience action plan will involve identifying the climate risks and putting up the capacity to anticipate them, absorb shocks and stresses within the campus.

This will involve:

- Carry out climate risk assessments.
- Develop and implement appropriate actions and interventions.
- Mobilize resources that will build capacity and scale up actions.

- Monitor and track progress.
- Share knowledge, experiences and solutions among the project team.

Some of the foreseen hazards that are projected and others that have occurred before within the proposed project location include but not limited to; Floods, fires, Extreme temperatures.

Photo 21: Picture of wetland within the proposed site

Source: Field survey 2025

The chart below is showing the climate resilient assessment process for the Kakamega Gold Refinery project.

IDENTIFY CLIMATE CHANGE HAZARDS AND RISKS

This involved projecting the hazards that may occur or noting the already observed hazards and understanding the likelihood of the occurrence and the consequence to the people and resources within the project site

IDENTIFY RESILIENCE OPTIONS

These options are dependent on 3 things:

Effectiveness - the capacity of the resilience option to reduce the vulnerability's overall risk.

Feasibility - is a measure of whether the option could be implemented—technically, organizationally, and politically.

Cost - the estimated monetary outlay price of the resilience option

RECCOMENDING THE BEST OPTION

This step involves recommending options that will be effective to reduce the occurrence of the risk other options that in case the hazard occurs then it will reduce the vulnerability

12.4 Climate Change Impacts on the Project

Climate Change Risk	Impact	Consequence	Adaptation/ Resilience/Mitigation
Rising Temperatures	Increased urban heat island (UHI) effect and higher internal temperatures.	Increased cooling demand, discomfort.	Mitigation measures include: - Design features building designs with heat-resistant materials. - Windows and ventilation openings allow for cross-ventilation, helping to keep indoor spaces cool and fresh without using fans or air conditioning systems. - Project features landscaping with grass and vegetation along the riparian reserve which can provide shading and lower temperatures.
	Reduced productivity causing construction delays and costs	Extreme heat events may decrease productivity. These delays can disrupt project timelines, increase labour costs, and escalate overall project expenses.	Mitigation measures: - Provision of adequate hydration stations (portable drinking water) and rest areas for workers. - Provide PPEs such as sun hats. - Consider temporary shades for workers during rest.
	Increased dust levels	Nuisance to neighbours.	- Use low speeds on unpaved (murram) roads to prevent too much dust rising.
Flooding and Heavy Rainfall	Overwhelmed drainage systems and surface runoff due to impermeable surfaces. Increased stream volume / flooding	Property damage, displacement, impassability/ inaccessibility	The project features: - Rainwater harvesting systems, - Grass blocks pavers with gaps shall be planted with grass within them, increasing ground absorption and reducing impervious surfaces and flooding. - The roadways shall be contoured (inverted crown design) to channel stormwater effectively toward the stream. - A riparian buffer zone shall be delineated to mitigate flood risk along the river. - There should be a vegetative buffer along the riparian reserve near the river. These planted areas will act as natural buffers preventing erosion of banks and flooding.

Climate Change Risk	Impact	Consequence	Adaptation/ Resilience/Mitigation
	Site flooding	Halt construction activities, damage construction materials, and create unsafe working conditions. Accelerated soil erosion, leading to sediment displacement and instability of the soil, which can affect the foundation of the structure being built.	Mitigation measures: - Schedule construction works for the foundations during the dry season. - Map all areas that need drainage systems and provide to efficiently manage stormwater runoff and minimize the risk of flooding and erosion. - Enhance the design and capacity of drainage systems to efficiently manage stormwater runoff and minimize the risk of flooding and erosion in the future.
	Damage to roads (access road) / inaccessibility	- Halting construction works - Delivery vehicles getting stuck. - Time wastage.	Mitigation measures: - Schedule construction works during dry weather. - Fix damaged sections where the unpaved access roads are impassable to facilitate material delivery.
Water Scarcity and Stress	Increased demand for water in a resource-scarce environment.	- High cost of water - Reduced water availability for residents - Conflicts and stress	The design features: - Water-efficient fixtures and systems. - Rainwater harvesting to supplement piped supply and borehole sources. - A treatment plant which can treat water to recyclable quality for landscaping. - Avail large capacity storage tanks.
	Scarcity of water for construction activities	Potential delays in construction schedules, increased costs due to reliance on alternative water sources.	- Have sufficient store for non-potable water for construction purposes.
	- Over abstraction of underground water sources. - Water wastage	Lowering the aquifer level	- Adhere to permitted abstraction limits from the borehole. - Water meters to monitor water consumption and usage. - Explore all other water source options and consider borehole use as the last resort.

12.5 The Project Impacts on Climate Change

The construction and operation of the gold refinery plant can significantly exacerbate climate change vulnerability due to the substantial greenhouse gas (GHG) emissions and environmental stress they impose. Construction activities, including the production and transport of materials like cement and steel, contribute to emissions that drive global warming. Moreover, clearing land and

altering natural landscapes disrupts ecosystems, increases surface temperatures, and reduces carbon-absorbing vegetation, adding to the urban heat island (UHI) effect.

During the operational phase, this development would demand high energy and water resources, further amplifying resource strain, especially in already climate-stressed rural areas. Additionally, the buildings making up the refinery plant can heighten flood risks by increasing impermeable surfaces, which impedes natural water infiltration and strains drainage systems.

Climate Change Risk	**Description**	**Adaptation/Mitigation Measures**
Increased Greenhouse Gas (GHG) Emissions	Emissions from construction machinery & vehicles. The gases such as Carbon dioxide (CO2) and methane originate from heavy machinery, transportation of materials, and energy-intensive processes.	Use of energy-efficient equipment. Routine servicing of equipment to increase efficiency and reduce emissions. Optimization of transportation trips to minimize fuel consumption.
	During operation, the plant would continue to emit GHGs due to high energy demands, which would often rely on non-renewable fuel sources.	Consideration using clean energy in the operations of the plant.
Urban Heat Island (UHI) Effect	Increased building density and surface heat retention in parking, roadways and walkways areas raise local temperatures, impacting indoor and outdoor comfort.	Project features landscaping with grass paving blocks, and vegetation along the riparian reserve which can provide shading and lower temperatures.
Waste Generation	Construction waste, if not managed properly, contributes to landfill accumulation and greenhouse gas emissions from waste decomposition.	Implement waste reduction practices, recycle construction materials, and source reusable or eco-friendly materials wherever possible.
Flood risks	Due to increased paved areas which reduces the infiltration of storm water and creates more runoff.	Maintenance of drainage and storm management infrastructure. The project features sustainable drainage features such as: grass paver blocks, the roadways shall be contoured (inverted crown design) to channel stormwater effectively toward the river, riparian vegetation and rainwater harvesting.

CHAPTER 13: CONCLUSIONS AND RECOMMENDATIONS

13.1 Conclusion

The findings of the ESIA based on the contract document, design reports and the baseline site assessment indicated that the project is desirable and will support the realisation of national and county development goals due to the benefits that will be realised. There is need for all the responsible stakeholders to implement the recommendations given in the ESMP to ensure sustainability of the project.

The project is an environmentally high-risk project and thus poses high threat to the environmental aspects if precautionary measures are not undertaken. The likely environmental impacts expected from the implementation of the project are however mitigatable both in construction and operation phases. Appropriate mitigation measures have therefore been put in place to take care of these during the construction, operation and decommissioning phases of the project.

The proponent and contractor are advised to implement Environmental and Social Management Plan (ESMP) so as to reduce adverse impacts and boost good environmental practices. Guidelines on environment, health and safety must also be followed in order to reduce incidences of accidents, health problems and compromise to environmental well-being.

As a result of this Environmental Impact Assessment study, the following conclusions were arrived at:

- This Project is in line with the Government of Kenya's Policies as outlined in mandates of various Ministries.
- It is also in line with SDGs on poverty reduction, improved livelihoods, reduction of infection and reduction in solid waste pollution.
- The result of the assessment shows that the proposed site has got no alternative.
- There were no major complaints or concerns raised by the stakeholders that may hinder the commencement of the project.
- The mechanisms to ensure that environmental and human effects are mitigated as much as possible have been outlined in the EMMP and the time period and cost to carry out these given for the proponent and management to follow.

13.2 Recommendations

Having considered the information collected and analysed, the following recommendations were arrived at:

- The proponent must adhere and implement in full the proposed Environmental and Social Management Plan. The proponent must observe adherence to the legislations discussed under Legal and Regulatory Chapter of this report.
- The contractor should ensure that all the construction activities are executed under supervision the activity expert to avoid substandard work at the construction and also to ensure the workers are secure and safe from carrying out the specific job.
- The contractor to deploy safety officer who will ensure that the construction area is safe both to staff and public. This can be done through barricading the construction site with safety tapes, installing warning signals, barring the public from accessing the construction site without permission from the management and ensuring all workers have proper clothing the construction.
- Ensure that worker's occupational health and safety standards are maintained through capacity building, proper training and providing protective clothing
- The contractor or safety officer to control traffic of vehicles bringing materials and also water the dusty areas which might have significant impact on the health of public and staff members.
- Annual environmental audits should be carried out on the project in order to ensure compliance of the project with the mitigation measures outlined in the Environmental Management, and Monitoring Plan (EMMP),
- All activities concerning construction and maintenance such as, work execution, site inspection, and material testing, shall be strictly monitored by an engineer or a designated official. This is important to ensure quality of maintenance works. Engineers and/or designated official shall be trained and experienced enough to judge the appropriateness of the work executed in order to carry out the monitoring properly.
- Portable toilets facility to be provided during construction to manage human waste.
- The community to ensure they enter an agreement with the contractor and avoid brokers when leasing/selling out land for borrow-pits. Also, the community to ensure a clause that states "timely backfilling and rehabilitation after excavation" is included in the contract so as to bind

the contractor. The community to approach the contractor and where possible dump the top soil/spoil in their old borrow-pits.

- Relevant signals showing direction and warnings to be erected within the site to offer rightful information to people.
- Overall, the experts conclude that the project is environmentally, socially and economically feasible and should be allowed to be implemented or as per NEMA discretion.

In addition, it is worth highlighting that project construction is inherently an efficient practice that seeks to minimise costs related to construction and maintenance. It is recommended the proponent adopt such practices including:

- Balancing earthworks to optimise cut and fill.
- Utilising local sources to minimise the import of materials.
- Stabilising additives to adapt local marginal materials.
- Ensuring impacts on the local environment and biodiversity are appropriately managed and revegetated.
- Optimising pavement thickness for anticipated conditions and loads.

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APPENDICES

Appendix I: NEMA Practicing Licences

Appendix II: Project Bill of Quantities

Appendix III: Proponent's KRA PIN Certificate

Appendix IV: Land Ownership Documents

Appendix V: Project Architectural Designs and Layout Plans

Appendix VI: Grievance Redress Mechanisms Forms

Appendix VII: Public Participation Meeting Minutes

Appendix VIII: Public Participation Questionnaires

Appendix I: NEMA Practicing Licences

EAE 23063278

FORM 7 (r.15(2))

nema
Mazingira Yetu | Uhai Wetu | Wajibu Wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/22558

Application Reference No: NEMA/EIA/EL/29432

M/S **KULOBA ABRAHAM**
(individual or firm) of address
P.O. Box 18180 - 00100 NAIROBI

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert General**

registration number **10709**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **2/11/2025** Expiry Date: **12/31/2025**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001 : 2015 Certified

EAE 23063279

FORM 7 (r.15(2))

nema
Mazingira Yetu | Uhai Wetu | Wajibu Wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/22559

Application Reference No: NEMA/EIA/EL/29433

M/S **KNOWBILITY CONSULTING LIMITED**
(individual or firm) of address
P.O. Box 18180 - 00100 NAIROBI

is licensed to practice in the capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Firm of Experts** registration number **11453**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **2/11/2025** Expiry Date: **12/31/2025**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001 : 2015 Certified

Appendix II: Project Bill of Quantities

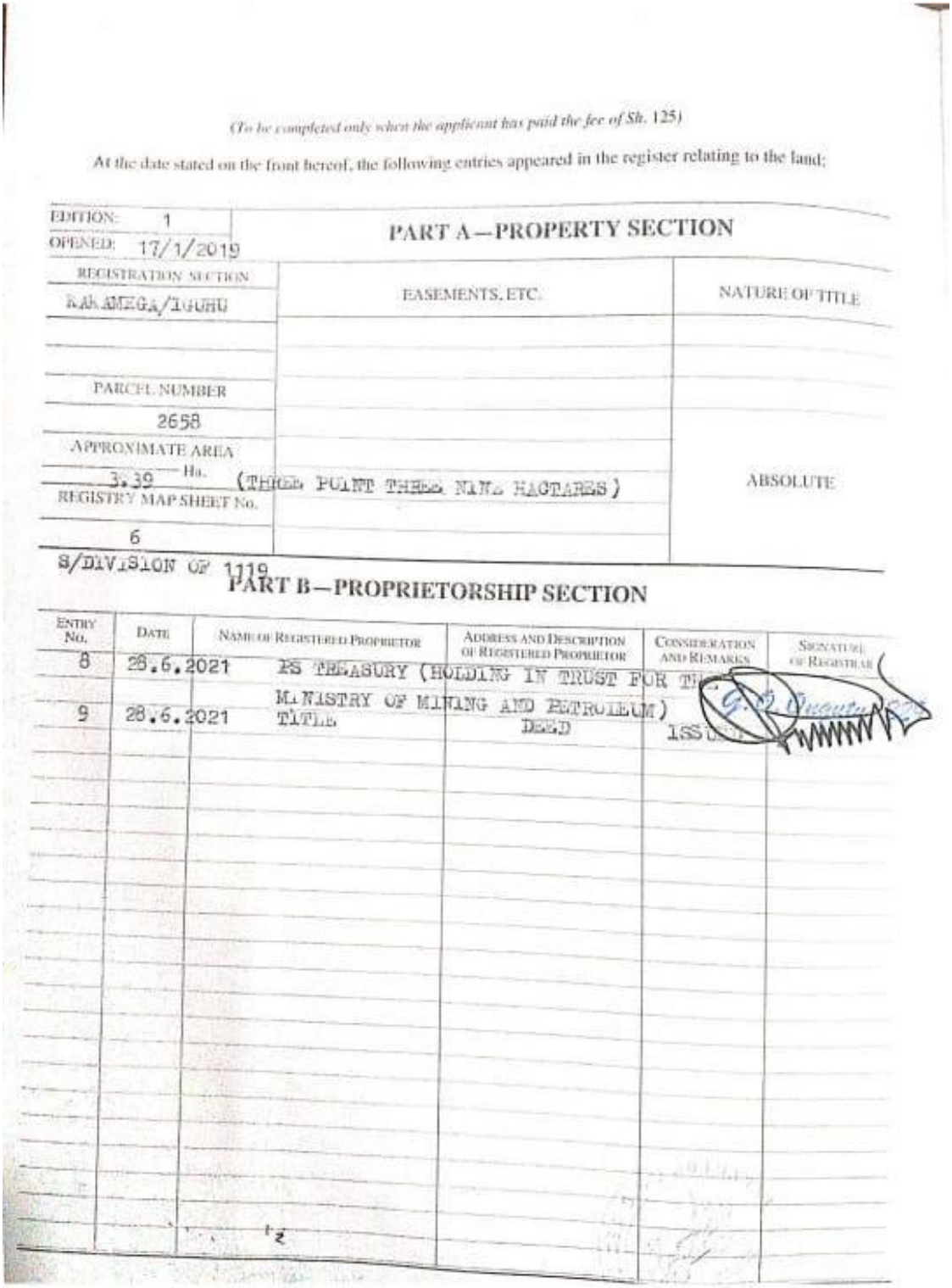
MAIN SUMMARY

THE PROPOSED GOLD REFINERY IN LIDAMBITSA, IGUHU, KAKAMEGA COUNTY

SECT. NO.	SECTION	PAGE NO.	Floor Area (SM)	CONTRACT SUM (KES)
	MAIN SUMMARY			
1.0	MOBILISATION AND PRELIMINARIES			3,794,000.00
2.0	ADMINISTRATION BLOCK		844	32,130,000.00
3.0	PROCESSING PLANT		432	19,440,000.00
4.0	EQUIPMENT STORAGE WAREHOUSES (2 NO.)		180	6,840,000.00
5.0	STAFF DINING/CAFETERIA		183	4,560,000.00
6.0	GOLD STORAGE AND DISPATCH AREA		90	8,588,000.00
7.0	STAFF ACCOMODATION BLOCK		886	34,200,000.00
8.0	TOWNHOUSES(2 NO.)		642	36,024,000.00
9.0	POLICE POSTS		24	912,000.00
10.0	SECURITY CHECKPOINTS		0	912,000.00
11.0	CLUBHOUSE-STAFF CANTEEN		76	1,216,000.00
12.0	STAFF RELAXATION AREA		40	1,824,000.00
	EXTERNAL WORKS			
A	EARTHWORKS AND LEVELLING			21,232,925.00
B	SITE DEMOLITIONS			500,000.00
D	MAIN ENTRANCE (GATEHOUSE) AND SIGNAGE			2,500,000.00
E	CIVIL WORKS			15,000,000.00
	TOTAL ESTIMATED CONSTRUCTION COST (INCL. VAT)	**KSHS.**		**189,672,925.00**

Appendix III: Proponent's KRA PIN Certificate

Appendix IV: Land Ownership Documents



(To be completed only when the applicant has paid the fee of Sh. 125)

At the date stated on the front hereof, the following entries appeared in the register relating to the land:

EDITION: 1
OPENED: 17/1/2019

PART A—PROPERTY SECTION

REGISTRATION SECTION	EASEMENTS, ETC.	NATURE OF TITLE
KAKAMEGA/IGUHU		
PARCEL NUMBER: 2658		
APPROXIMATE AREA: 3.39 Ha. (THREE POINT THREE NINE HACTARES)		ABSOLUTE
REGISTRY MAP SHEET No.: 6		

S/DIVISION OF 1119

PART B—PROPRIETORSHIP SECTION

ENTRY No.	DATE	NAME OF REGISTERED PROPRIETOR	ADDRESS AND DESCRIPTION OF REGISTERED PROPRIETOR	CONSIDERATION AND REMARKS	SIGNATURE OF REGISTRAR
8	28.6.2021	PS TREASURY (HOLDING IN TRUST FOR TH			
9	28.6.2021	MINISTRY OF MINING AND PETROLEUM) TITLE	DEED	ISSU	

REPUBLIC OF KENYA

THE LAND REGISTRATION ACT

(No. 3 of 2012, section 108)

THE REGISTERED LAND ACT

(Chapter 300) (REPEALED)

Title Deed

Title Number KAKAMEGA/IGUHU/2659

Approximate Area 0.67HA

Registry Map Sheet No. 6

This is to certify that THE TREASURY

(HOLDING IN TRUST FOR THE MINISTRY OF MINING AND PETROLEUM)

$ $ $

$ $

is (are) now registered as the absolute proprietor(s) of the land comprised in the above-mentioned title, subject to the entries in the register relating to the land and to such of the overriding interests set out in section 28 of the Land Registration Act (No. 3 of 2012) as may for the time being subsist and affect the land.

GIVEN under my hand and the seal of the KAKAMEGA District Land Registry this 28TH day of JUNE, 2021

Land Registrar

G.O. Ingutu "229

(To be completed only when the applicant has paid the fee of Sh. 125)

At the date stated on the front hereof, the following entries appeared in the register relating to the land:

EDITION: 1
OPENED: 17.1.2019

PART A—PROPERTY SECTION

REGISTRATION SECTION	EASEMENTS, ETC.	NATURE OF TITLE
KAKAMEGA/IGUHU		
PARCEL NUMBER: 2659		
APPROXIMATE AREA: 0.67— Ha.	(ZERO POINT SIX SEVEN OF A HACTARE)	ABSOLUTE
REGISTRY MAP SHEET No.: 6		

S/DIVISION OF 1119

PART B—PROPRIETORSHIP SECTION

ENTRY No.	DATE	NAME OF REGISTERED PROPRIETOR	ADDRESS AND DESCRIPTION OF REGISTERED PROPRIETOR	CONSIDERATION AND REMARKS	SIGNATURE OF REGISTRAR
8	28.6.2021	PS TREASURY (HOLDING IN TRUST FOR THE MINISTRY OF MINING AND PETROLEUM)			
9	28.6.2021	TITLE	DEED	ISSUED	G.O. Ongoto *229

Appendix V: Project Architectural Designs and Layout Plans

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE 01 | MASTER PLAN AERIAL VIEW

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE 02 | MASTER PLAN AERIAL VIEW

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE 03 ADMINISTRATION BLOCK

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE 04 ADMINISTRATION BLOCK

KAKAMEGA GOLD REFINERY	OCTOBER, 2024

PERSPECTIVE 05	ADMINISTRATION BLOCK

KAKAMEGA GOLD REFINERY	OCTOBER, 2024

PERSPECTIVE 06	STAFF CAFETERIA

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE 07 TOWN HOUSES

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE 08 TOWN HOUSES & STAFF DORMITORY

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE 09 STAFF DORMITORY

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE 10 GOLD REFINERY SECTION

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE I1 | GOLD REFINERY SECTION

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE I2 | GOLD REFINERY SECTION

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE 13 | GOLD REFINERY SECTION

KAKAMEGA GOLD REFINERY | OCTOBER, 2024

PERSPECTIVE 14 | CLUB HOUSE

KAKAMEGA GOLD REFINERY	OCTOBER, 2024

PERSPECTIVE 15	PHASE 01 & 02	CONCISE PROJECTS

Appendix VI: Grievance Redress Mechanisms Forms

Appendix VI-A: Grievance Statement Form

Name of the Complainant: _____

Address: _____

Phone Number (if available): _____

Gender: _____

Age: _____

Grievance Subject: _____

Grievance Reference Number: _____

Grievance Statement: _____

_____

_____

_____

_____

_____

_____

Complainant Signature: _____

Name & Signature of Receiving Officer: _____

Date & Stamp: _____

Appendix VI-B: Grievance Receipt Acknowledgement Form

This form is for acknowledging of receipt of your Grievance; Kakamega Gold Refinery Project Implementing Office/Unit. **Officer commits that will inform you the investigation of your Grievance within thirty days (30) from the receipt of your Grievance.**
Name of the Complainant:
Full Address (Town/Village):
Phone number of the Complainant (if available):
Grievance Reference Number:
Place where the Grievance was Received:
Brief Description/ Subject of the Grievance: …… …… …… …… …… ……
Name of the Officer who Received the Grievance:
Signature of the Officer Receiving the Grievance:
Date:

Appendix VI-C: Grievance Investigation Form

Name of the Complainant: _____

Address: (Town/Village): _____

Phone Number (if available): _____

Gender: _____

Age: _____

Grievance Subject: _____

Grievance Reference Number: _____

Grievance Investigation Details/Facts: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Investigator Name and Signature: _____

_____

Date: _____

Appendix VI-D: Grievance Investigation Outcome Form

Grievance Reference Number: _____

Complainant Name: _____

Address: _____

Town/village: _____

Phone Number: _____

Grievance Subject: _____

Investigation Completion Date: _____

Investigation Details: _____

_____

_____

_____

_____

_____

_____

_____

_____

I agree that I have received the outcome of the investigation: _____

Signature: _____

Name of the Complainant: _____

Date: _____

I agree that I have been Informed with respect on the Investigation outcome of my Grievance.

I accept the outcome and that I have no objection.