ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE CONSTRUCTION OF GOLD ORES PROCESSING AND WASHING FACILITIES IN LOT 1 – Shinyanga Region

Proponent

Vicent Benedicto Busiga Site
Mwabomba Village, Idahina Ward, Kahama District

Submitted by:

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Executive Summary

1. Introduction

The Tanzania Environmental Health and Pollution Management Project (EHPMP) was launched to mitigate health risks associated with unsafe mercury use in Artisanal and Small-scale Gold Mining (ASGM) by enhancing institutional capacity for mercury regulation and promoting alternative gold recovery technologies. Funded by the Global Environmental Facility through a partnership between the Government of Tanzania and the Word Bank, the project is led by the National Environmental Management Council (NEMC), in collaboration with the Mining Commission. It includes the construction of mercury mineral processing centers with Personal Protective Equipment (PPE) as demonstration sites for safe mercury handling across seven ASGM-concentrated regions, specifically focusing on Shinyanga and Singida in its initial phase.

2. Project Description

The project is located at the Vicent Benedicto Busiga site in Mwabomba village, Idahina ward, Kahama district of Shinyanga Region, specifically situated at coordinates (03°49'28.0992"S, 032°06'59.4576"E). Access to the site is gained by traveling approximately 55 km north on the main Kahama to Rusumo highway to Masumbwe Center (in Geita Region), followed by a 23 km journey along an all-weather earth road. Proposed facilities include essential infrastructure for processing and washing gold ore such as crushers, sluicing boxes, a washing bay, water storage and collection systems, and amalgamation equipment designed to handle mercury safely.

Operational activities will commence with site preparation, including vegetation clearance and equipment transportation, followed by a systematic process for extracting and refining gold. This includes ore drying, hand hammer crushing, and milling to ensure optimal particle size for effective gold recovery. Sluicing techniques will separate gold from other minerals, culminating in the amalgamation with mercury for gold extraction. Throughout the operation, strict adherence to safety protocols and environmental compliance will be maintained, supported by ongoing monitoring and quality control to ensure efficient extraction and high-quality gold refinement.

3. Legal Requirements

The proposed project complies with various policies, legislations, standards, regulations, and guidelines to ensure legal and regulatory compliance. Relevant policies include the National Environmental Policy (2021), National Mineral Policy (2009), and National Health Policy (URT, 2003), among others. Legislation and Regulations include the Environmental Management Act of 2004, the Mining Act, of 2010, the Water Resources Management Act, of 2009, the Occupational Safety and

Health Act of 2015, and the Tanzania Extractive Industries (Transparency and Accountability) Act No. 21 of 2015.

The project involves collaboration with multiple government institutions and stakeholders. These include the Vice President's Office (Division of Environment), Ministry of Minerals, Ministry of Water, National Environmental Management Council (NEMC), the National Environmental Advisory Committee, local councils (District, Ward, and Village), as well as NGOs/CBOs and Environmental Management Committee, who will work together to ensure environmental management, regulation, and compliance with laws and regulations.

4. Environmental Baseline Information

The project site in Mwabomba, Kahama district, has been assessed to determine its biodiversity baseline. The study involved onsite surveys, interviews with locals, focus group discussions, opportunistic sampling, and a review of relevant documents. The site's vegetation is characterized by Miombo woodland, alien plant species in settlements, and cultivations outside the project area. The vegetation provides essential benefits to residents, including firewood, building materials, shade, and timber for mining shafts. No species of conservation concern were identified at the project site.

The climate in Kahama district is characterized by a moderate temperature range (17°C - 32°C) with a rainy season from October to May and a dry season from June to September. Evaporation rates are relatively high, ranging from 150mm to 275mm per month. The hydrology and surface water resources, as well as hydrogeology and groundwater resources, have been assessed to determine aquifer types, groundwater flow, recharge, yield, and hydraulic parameters. The socio-economic baseline for the study covers the main activities in the Kahama district, including agriculture, livestock keeping, fishing, mining, and forestry.

5. Stakeholder Engagement

The stakeholders consulted for the project include the Shinyanga Regional Commissioner’s Office, Resident Mine Office, GCLA Office, TFS, OSHA, Fire and Rescue Office, Kahama Municipal Office, Lake Victoria Basin Office, as well as Ward and village offices. Key issues raised during these consultations include potential hazards associated with mercury use, concerns over child labor, early pregnancies, and school dropouts, and the paramount importance of health and safety throughout project implementation. Addressing these issues will be part of the Environmental and Social Management Plan (ESMP) and monitoring development.

6. Impact Identification, Mitigation, and ESMP

The potential impacts were identified during the Environmental and Social Impact Assessment (ESIA) study, which considered project activities, stakeholder

consultations, and various studies. Key concerns include hazardous waste management at pilot sites, dust and particulate pollution affecting nearby families and sensitive groups, noise disturbances from machinery near health centers, schools, and elderly homes, as well as occupational health and safety issues for workers and their employment conditions. To address these impacts, the Environmental and Social Management Plan (ESMP) includes mitigation measures and allocates resources for proper management. An HSE Manager will be responsible for overseeing the implementation of the ESMP, ensuring compliance throughout the project's mobilization, construction, operational, and decommissioning phases, with associated costs clearly estimated.

7. Environmental and Social Monitoring Plan

Monitoring is done to check the performance of the mitigation measures on adverse impacts because of project activities. Water, air, vibration, sounds, and rehabilitation will be monitored. Sampling points will be classified as ambient/background, operational, and downstream (compliance points). Sampling of water, dust, and vibrations will be done quarterly. Rehabilitation progress is taken over time with available mined disturbed areas such as pits areas.

8. Cost -Benefit Analysis

By comparing the tangible and intangible costs of the project which have inbuilt recovery/mitigation measures with the benefits of the project, it is clear that the project will be more beneficial than costly to the local communities, local environment, and the nation at large.

9. Decommissioning

The closure plan aims to establish safe, stable final landforms, with self-sustaining vegetation, similar to that in the surrounding landscape. The project implementation team will develop a detailed decommissioning plan outlining the necessary activities for the Gold Ore Processing and Washing Facilities that will be involved in the decommissioning process. Additionally, an environmental study will be conducted to assess potential impacts and propose mitigation measures during the decommissioning phase, which will be submitted for approval by NEMC and other regulatory bodies. Upon successful completion of the decommissioning activities outlined in the plan, NEMC will issue a certificate of surrender by Section 37(1) of the EIA and EA Regulations of 2005.

10. Conclusion and Recommendation

The project at the Vicent Benedicto Busiga site is in Mwabomba village, Idahina ward, Kahama district, Shinyanga Region, accessible via the Kahama to Rusumo highway

followed by a 23 km all-weather earth road. Management plans have been crafted to address potential impacts associated with project activities, supported by baseline studies of the physical, biological, and socio-economic environments to ensure effective identification and mitigation of all project-related impacts. The initiative is anticipated to bring substantial socio-economic benefits to the local communities, the Shinyanga Region, and Tanzanian society overall, with no significant adverse environmental or social effects expected beyond existing mining operations. The identified potential impacts are manageable through the proposed Environmental and Social Management Plan (ESMP) and a Monitoring Plan, demonstrating NEMC's commitment to environmentally sustainable implementation, as evidenced by ongoing on-site activities. In conclusion, the project should proceed as planned, as the implementation of the proposed EMP and Monitoring Plan will effectively manage identified impacts, allowing for the realization of substantial benefits.

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Abbreviations

Abbreviation	Meaning
ASGM	Artisanal and Small scale Gold Miners
EIA	Environmental Impact Assessment
EMA	Environment Management Act
EPP	Environmental Protection Plan
ESCP	Environmental and Social Commitment Plan
ESIA	Environmental Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standards
HSE	Health, Safety and Environment
ICGLR	International Conference of the Great Lakes Region
MC	Municipal Council
MRO	Mines Resident Officer
OECD	Organization for Economic Co-operation and Development
PIT	Project Implementation Team
PML	Primary Mining License
RC	Regional Commissioner
RINR	Regional Initiative against the Illegal Exploitation of Natural Resources
RMO (Mines)	Resident Mines Officer
RMO	Regional Medical Officer
ROM	Run of Mine
SEP	Stakeholder Engagement Plan
URT	United Republic of Tanzania
WB	World Bank

1 Introduction

1.1 Background

The Tanzania Environmental Health and Pollution Management Project (EHPMP) has been initiated as one of the measures to reduce the health risks associated with the unsafe use of mercury in Artisanal and Small-scale Gold Mining (ASGM). It aims to strengthen the institutional capacity to manage and regulate mercury use in the ASGM and to introduce alternative technologies to mercury for gold recovery in ASGM subsector that can be adopted and accepted by the ASG miners, service providers, Local communities surrounding the mining sites and Regulators. It is funded by the Global Environmental Facility (GEF) through a grant aid agreement signed by the Government of Tanzania (GoT) and the World bank (WB).

Component 3 of the project, titled Demonstrating the Application of Technological Tools and Economic Approaches, involves the selection and application of specific cleaner technologies in contaminated areas of these selected sites. One of the actions under component 3 involves the Piloting of alternative technology in ASGM which involves the construction of mineral processing centres equipped with personal protective equipment (PPEs) for best environmental practices. These facilities will be used as demonstration centres for the safe handling of mercury to ASGM in the project implementation regions.

The National Environmental Management Council (NEMC) is the Project Implementation Team (PIT) for this project collaborating with the Mining Commission intend to construct Mercury mineral processing centres equipped with Personal Protective Equipment (PPE) to be used as demonstration centres for the safe handling of Mercury in Artisanal and Small-scale Gold Mining (ASGM) sites found in the seven (7) selected regions that have the greatest concentration of ASGM i.e., Geita, Mara, Mwanza, Shinyanga, Singida, Mbeya and Songwe. The project is divided into several Lots. This project covers the Lot 1 proposed demonstration minerals centers in S the Shinyanga and Singida Regions which are shown on Figure 1-1 specifically the Mwabomba Site depicted on Figure 3-1. The ownership of the sites under Lot 1 is included in Table 1-1.

Table 1-1: ASGM Sites included in this Project

Region	District	Ward	Village	Site Owner/Operator Name
Singida	Ikungu	Mang'onyi	Sumbaru	Marwa Marwa and partners
	Iramba	Twike	Nkonkilangi	Sekenke One Mining Co. Society Ltd
Shinyanga	Kahama	Zongomela	Mwime	Umoja wa Wenye Mashamba Ilindi
	Kahama	Idahima	Mwabomba	Vicent Benedicto Busiga-Mwabomba 02

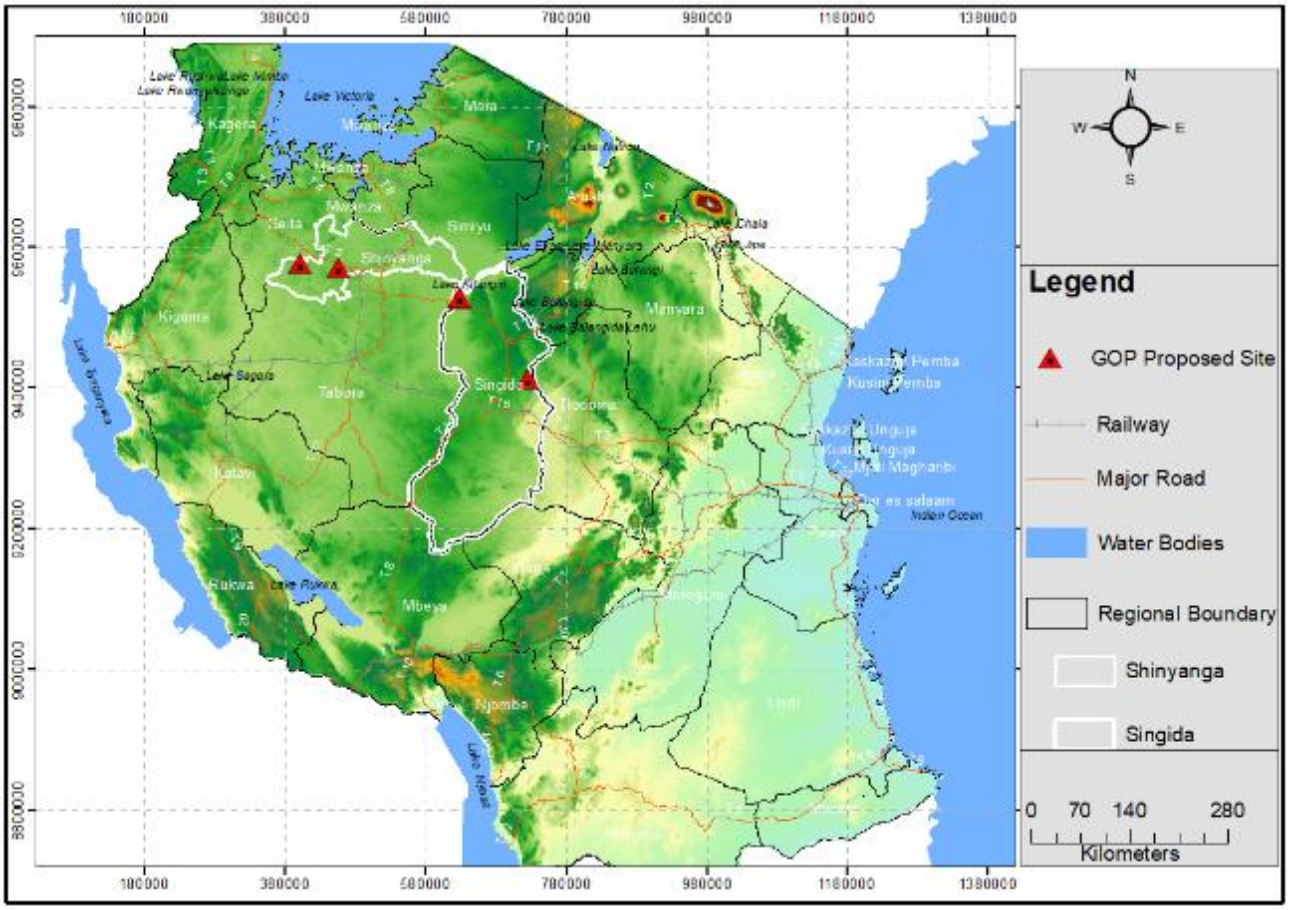


Figure 1-1: Location of the Proposed Mercury Processing Demonstration Sites in Shinyanga and Singida

To align with the Project Environmental and Social Commitment Plan (ESCP) requirements and the Environment Management Act of 2004, the Project Implementation Team (PIT) under the National Environment Management Council (NEMC) has engaged an Individual Environmental Expert, Eng. Anael Macha, to undertake an Environmental Impact Assessment (EIA) of the proposed demonstration minerals centers in Shinyanga and Singida Regions.

1.2 Project Rationale

The mining sector is currently contributing 5.2% of the country's Gross Domestic Product (GDP), the bigger share being gold. The Tanzanian gold mining sector comprises of two subsectors: the Large-Scale Mining (LSM) subsector, which is associated with large Foreign Direct Investment (FDI), infrastructure development, technology transfer, high productivity and high export earnings. The second subsector is Artisanal and Small-Scale Mining, and it often involves local miners using basic methods to extract near-surface deposits. ASM is associated with low investment and low productivity, but it accounts for most of the sector's employment and is more accessible to the poor, especially in rural areas.

ASGM in Tanzania contributes about 90% of the total employment in the mining sector and contributed 30% of total gold production (42 tonnes) in the year 2020/2021. For many of these mining is a way of life supporting a variety of livelihoods. A study commissioned by IIED on the interaction of ASM and agriculture estimated the number of active ASM participants in Tanzania to be around 1.5 million (service providers, financiers, surface rights holders and miners) with 9 million people depending on the sub-sector for their livelihoods. This is close to the numbers reported in the National Action Plan on ASGM which states A total of about 1.2

million people are engaged in ASGM activities in Tanzania with an estimate of 7.2 million people (equivalent to 13% of the total national population) depending indirectly on ASGM.

The gold processing and recovery method deployed by ASGM is dominated by use of mercury due to its affordability, ease of use (does not need and as it has been used for many years ASGM are familiar/experienced with its supply chains and use. Mercury is used to separate gold from other minerals/materials in the mined ore due to its ability to bind to gold and form an amalgam. Mercury is released into the environment during amalgamation, separation of amalgamation from pan water, removal of excess mercury and burning of the remaining amalgam to evaporate the mercury and produce a gold sponge. Mercury fumes are colorless and odorless hence one does not notice that they have been exposed. The problem is worsened when gold shops are located in urban areas where many people can be unknowingly exposed. In addition to the acute inhalation concern, this mercury is emitted to the atmosphere and circulates around the world causing global pollution of ecosystems and the food chain - particularly fish.

Mercury is a powerful neurotoxin that is harmful to people, but especially to developing foetuses, and young children. Once emitted, mercury can travel great distances through the atmosphere, causing global contamination of ecosystems, fish, birds, mammals, and the human food chain Millions of miners, infants, children, women of child bearing age (potentially pregnant), and breast-feeding women, work or live in ASGM communities and are at risk of mercury exposure [1].

The major exposure of mercury on the ASGM communities occur during the amalgamation process burning as it is undertaken without wearing appropriate Personal Protective Equipment (PPEs) with bare hands and no respiratory protection, or encasing of fumes during open burning of the amalgam to remove the mercury and remain with the pure gold. Baseline situational analysis included in the ASGM National Action Plan states that national mercury consumption by ASGM is about 13.2 - 24.4 tonnes per year. The EHPMP Project implementation document also states that available literatures indicate that in ASGM for every 1kg of gold recovered about 2 kg of mercury is used and most of it is released into the environment.

Minamata initial assessment survey done by the United Republic of Tanzania (URT) in 2016/2017 indicated that gold extraction with mercury amalgamation processes contributed to releasing mercury of 602 kg/annum to air; 520 kg/annum to water; and 642 kg/annum to land. It is also reported that manually squeezed amalgam usually contain 40-60% mercury. The report also indicated that ASGM are the most affected subsector, where about 1.5 million people were estimated to be at mercury exposure risks, of which 20-30% were women including about 75,000 children[2].

Due to the importance of ASGM in supporting both the country's GDP and livelihoods, this project has been initiated to assist in reducing the risks while looking for alternative technologies.

1.3 Site Selection

The project ESCP required that the PIT screen the project site in accordance to the exclusion criteria that the project sites will NOT:

[1] AGC_Practical-Guide-on-Reducing-Mercury-in-ASGM_en.pdf (artisanalgold.org)

[2] (PDF) Situational Analysis of Gold Processing Practices at Artisanal and Small-Scale Gold Mining in Tanzania (researchgate.net)

- require land acquisition, loss of access to natural resources or involuntary physical and/or economic displacement of households including those without legally recognizable rights to the land.
- utilize land with outstanding land disputes.
- be a significant source of pollution such as having runoff or leading to negative health and environmental effects,
- be located in a degraded area,
- be located close to areas important for biodiversity. For example, not be situated in critical habitats, natural habitats or other legally protected areas;
- be on locations where forced or child labor exists.
- be close to a zone of the Riparian zone;
- have a high ground water table.
- be inaccessible by road
- The site for locating the demonstration pilot will be selected in consultation with the stakeholders and will be one that is easily accessible to the artisanal small-scale miners.

To align with these requirements, the PIT conducted a site selection exercise in July and August 2022. The sites considered were provided by the Mining Commission and they were in areas within active ASGM areas some of which have been licensed under the Mining Act of 2010 as revised in 2019 whereas others are Gold Rushes but recognized by the Mining Commission. The criteria used were: how active the site was, number of miners (not less than 100), mining pits, washing bays, PMLs and their production capacity, their historical profiles (period of operation), and issues related to surface rights (Land ownership, surface rights conflicts status, closeness to water bodies, residential and protected areas. Additional criteria for the process included: the sites being free of conflict; PML owners or surface right owners' consent to provide land for the Project without compensation; and the site is away from sensitive environmental features (i.e., not within a protective area, at least **60M** from natural water sources as per Environmental Management Act (EMA) 2004 and at least **200M** from residential as per Mining Act 2010). If a site did not meet the key criteria it was not considered further for project implementation[3].

1.4 Preliminary Studies

NEMC had conducted environmental baseline studies for the sites and collected data pertaining to air, soil, water and noise quality. Furthermore, some stakeholder engagement relevant for the preliminary studies was done covering Regional Administrative Secretaries, Miners' Associations Leaders, LGA (Village to District Level), PML Owners, Miners, and Resident Mines Officers (RMO).

[3] Report For Selection Of Sites For Proposed Construction Of ASGM Demonstration Centres Under EHPMP Project Activities,October 2022

1.5 Objectives

The main objective of this project is to undertake an Environmental and Social Impact Assessment (ESIA) for the development of ASGM gold processing and washing facilities for two main aims:

1. To obtain an EIA certificate in accordance with the Environmental Impact Assessment and Audit Regulations of 2005 as Amended in 2018
2. To comply with the financiers' requirements which have been narrated in the project Environmental and Social Management Commitment Plan

Specific Objectives of this study as adopted from ESMF Annex III are:

- Establish the baseline conditions of the study area through a combination of desk review of data provided by NEMC, consultations and site visits taking account of any committed development projects which could change the baseline in the future.
- Identify environmental constraints and opportunities associated with the study area which may influence, or be affected by the proposed technologies.
- Identify and assess any environmental impacts (both positive and negative) which could result from the proposed project.
- Identify and incorporate into project design and operation, features and measures to avoid or mitigate adverse impacts and enhance beneficial impacts; and
- Assess the level of significance of all residual effects (direct and indirect, adverse and beneficial, short-term and long-term, permanent and temporary) taking into account of the proposed mitigation measures

1.6 Scope

It is important to define the spatial, administrative, legislative and technical scope of the ESIA study to ensure that the approach and methodologies applied are appropriate to meet the objectives of the study.

Spatial boundaries of the project will cover the project core sites (Sumbaru, Ikungu District and Nkonkilangi, Iramba District of Singida region; and Mwime and Mwaboma areas, Kahama District of Shinyanga Region;) and about 100m radius. For environmental resources (Climate, topography, geology, soils, seismicity, air, water, flora, fauna) will be in accordance to the floristic, habitat/ecological, catchment area, sub basin, basin and zonal/regional boundaries; Social boundaries will follow the administrative framework from village, ward, district and regional levels;

Legislative scope are based on the key legislation and standards governing mining, environment, labour and the respective natural resources plus the documents developed by the project to comply with the WB ESS Standards i.e the project ESMF and ESCP. At minimum the policies, legislation, standards and guidelines that will govern this ESIA study include:

- The Mining Act (2010 as revised in 2019) and subsidiary regulations on Occupational Health, Safety and Environmental Protection (2010)
- The Environmental Management Act No. 20 (2004) and subsidiary regulations on Environmental Impact Assessment and Audit Regulations (2005 as revised in 2018), Environment Quality Standards (2007, 2015), Environment Management – Solid and Hazardous Waste Regulations

- The Occupational Health and Safety Act No. 5 of 2003 and subsidiary regulations.
- The Employment and Labour Relations Act of 2004 and subsidiary rules
- The Industrial and Consumer Chemicals (Management and Control) Act of 2003 and subsidiary regulations of 2020
- WB General EHS and Mining Guidelines
- WB ESS Standards that have been identified as relevant to the project as included in section 2.2.2; the project Environmental and Social Commitment Plan (ESCP); Stakeholder Engagement Plan (SEP); and Labour Management Plan (LMP)

1.7 ESIA Terms of Reference

The terms of reference for this study prepared that covered requirements under the Environmental Impact Assessment and Audit Regulations and the World Bank Environmental and Social Standards specifically:

ESS 1: Assessment and Management of Environment Risks and Impacts

ESS 2 Labour and Working Conditions

ESS 3: Resource Efficiency and Pollution Prevention

ESS 4: Community health and Safety

ESS 10: Stakeholder Engagement and Information Disclosure

1.8 Methodology

The methodologies that were adopted for the study involved desktop document review and use of software including GIS for mapping; Soil and Water Assessment Tool (SWAT) for delineate catchments and define streams; Excel for data analysis and word for reporting were also applied; and field studies for collecting biophysical and socio economic information.

1.8.1 Document Review

Several documents will be revised to obtain information pertaining to the project design, components and activities; baseline physical, biological and socio-economic environment; legislative environment; environmental standards; ASGM norms; Use of Mercury best practices; similar activities impacts; best practices in baseline data collection, stakeholder engagement and impact assessment; best practices in related impacts mitigation. Documentation that will be covered include:

- Project design document and operational manual (once available); Project ESMF, ESCP, SEP, LMP
- Principal Act and subsidiary regulations governing Mining, Environment Management, Water, Public Health, Chemicals, Gender and Child Labour;
- International standards including The World Bank Environmental and Social Standards, General and Mining EHS Standards; Minamata Convention on Mercury; and UN Global Mercury Assessment.
- Local studies on ASGM practices and impacts including the National Action Plan for Artisanal and Small-Scale Gold Mining 2020-2025, Artisanal and small-scale mining in Tanzania – Evidence to inform an ‘action dialogue.

1.8.2 Field Visits

The project team visited the four sites included in this study to get firsthand information on the site and surrounding environment conditions by observation: stakeholder consultation and field surveys. No field measurements and sample collection will be undertaken to establish the flora, fauna vibration, noise, air quality, water and soil quality as this activity was already undertaken by the PIT during site selection and preparatory works and were provided by NEMC to the consultant as per contract. Field surveys were mainly to identify and map the different environmental components e.g. vegetation, surface and groundwater sources, mining pits; processing and washing facilities; health facilities; etc.

1.8.3 Stakeholder Analysis and Consultation

Identification of persons/groups who have a vested interest in the project allows for knowledge of vulnerable or influential stakeholders. Stakeholder engagement allows for disclosure of project information and inclusion of stakeholders' views/concerns/impacts on the project in the design and ESMP. The project Stakeholder Engagement Plan is the key document guiding stakeholder identification, categorization and engagement at the project sites. To enhance that engagement is free, prior and informed then the team will send notification (Official letters, notices, electronic mail or via phone) with agenda at least a week before the engagement date.

Annex I of the SEP has already identified some of the key stakeholders to be included in the study. At minimum stakeholders to be consulted will include host communities, LGAs at village, ward, district and regional level; and sectoral regulators e.g Forests, Water. For health and gender matters RMO, DMO, medical personnel, police, NGOs, local schools, local health facilities and ASGM groups. Consultation methods to be applied will include consultative meetings, interviews; focus group discussions; and meetings depending on the category of stakeholder and availability.

1.8.4 Field Surveys

To establish the existing hydrology, hydrogeology, vegetation and wildlife types and species in the area random and transect walks and interviews with community members who utilize ecosystem services for various activities e.g. wood/timber gathering, herbalists, hunters, fishermen will be undertaken. GPS coordinates and photographs will be taken for refence once back in the office and for inclusion in the study.

1.8.5 Impact Identification and Assessment

Some of the potential impacts of this project are narrated in section 3.1 of the ESMF and will be included. Due to its simplicity the Leopold Matrix will be used to identify the Valuable Ecosystem Components that will interact with the project. The criteria used for impact assessment will at minimum include type (+/-), scale, duration, magnitude, reversibility, and probability of occurrence. The Consultant will consider table 1 and Annex II included in the project ESMF for significance rankings. Matrices that aid in assigning a value to the criteria for impact assessment to establish significance may also be adopted as long as they align with ESMF Annex II included in Appendix IV.

1.8.6 Mitigation, ESMP, and Monitoring

Statutory requirements (particularly the EIA and Audit Regulations of 2005 as amended in 2018), WB ESMF, best practices and guidelines for similar projects and context will be the main criteria used to propose mitigation, management and monitoring requirements for the project. The proposed mitigation measures will take into consideration the receiving environment, technological feasibility, local applicability, and social acceptance in its proposal. The ESMP chapter will be presented in accordance to Annex IV of the ESMF; however, as the

ESIA report which will adopt the format required in ESMF Annex III, item 2: Project Description, will not be repeated in the ESMP section.

1.9 Structure of the Report

This ESIA report structure includes the following:

Executive summary

Legal and Regulation Framework: Analyzes the legal and institutional framework for the project in relation to the WB ESS and General EHS Guidelines.

Project Description: Describes the proposed project and its geographic, environmental, social, and temporal context, including any offsite investments that may be required. For the EHPMP, this should also describe the criteria for selection of the e-waste and mercury reduction technology selected, the various options/alternatives considered and a description of the selected technology.

Baseline Data: describes the area of influence and relevant physical, biological, and socioeconomic conditions, including any changes anticipated before the project commences.

Alternatives analysis: describes the Site selection criteria, quantifies the environmental and social impacts to the extent possible, and attaches economic values where feasible.

E&S Risks and Impacts: relevant environmental and social risks and impacts of the project. This will include the environmental and social risks and impacts specifically identified in ESS2–8, and any other environmental and social risks and impacts arising as a consequence of the specific nature and context of the project, including the risks and impacts identified in ESS1, paragraph 28. It should include the positive environmental and social outcomes as well.

Mitigation Measures: Identifies mitigation measures to manage the environmental and social impacts and significant residual negative impacts that cannot be mitigated and, to the extent possible, assesses the acceptability of those residual negative impacts. Identifies differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable. Assesses the feasibility of mitigating the environmental and social impacts; the capital and recurrent costs of proposed mitigation measures, and their suitability under local conditions; and the institutional, training, and monitoring requirements for the proposed mitigation measures. Specifies issues that do not require further attention, providing the basis for this determination. Covers Environmental and workers' health and safety measures. Includes a monitoring plan identifying parameters to be monitored, frequency and the responsible authority.

Public consultation and information disclosure: Stakeholder engagement plan, Grievance Redress System

Institutional Arrangements and Reporting

Annexes

- List of the individuals or organizations that prepared or contributed to the environmental

and social assessment.

- References etting out the written materials, both published and unpublished, that have been used.
- Record of meetings, consultations and surveys with stakeholders, including those with affected people and other interested parties.

2 Legal and Regulation Framework

2.1 Legislation

Mining activities in Tanzania are governed by the Mining Act of 2010, as revised in 2019, which provides access to minerals to Artisanal and Small Scale Miners by requiring them to operate in areas that are under Primary Mining Licenses. The act also has Mining (Environmental Protection for Small Scale Miners) Regulations of 2010, which describe the minimum health, safety and environmental protection requirements and standards for ASGM. The environment management of ASGM is regulated by the Environment Management Act 2004 (EMA), through the Environment Impact Assessment and Audit Regulations of 2005 as Ammended in 2018. ASGM activities need to obtain an EIA certificate and implement an Environmental and Social Management Plan. However, during the field visit it was observed that most of the ASGM operations still follow the Mining (Environmental Protection for Small Scale Miners) Regulations of 2010, even though there was awareness that they need to adopt the EMA 2004 requirements. Table 2-1 Outlines the key legislation that ASGM need to follow and their relevance to this project.

Table 2-1: Legislation that Govern the Project

Legislation	Description	Relevance to the Project
Mining Act RE 2019		
Section 55. Grant and Validity of a Primary Mining License Mining (Mineral Rights) Regulations 2018 reg 7(g) Area of PML	provides small-scale miners with the opportunity to acquire PMLs with access to not more than ten (10) hectares granted for seven years and can be mortgaged, renewed or transferred to another holder subject the PML holders to follow regulations pertaining to Health and Environmental protection allows stacking or dumping minerals or waste in line with applicable regulations	All the project areas had PMLs Has a designated HSE Officer and Fundi
Section 64. Abandonment	Provides a procedure for abandoning land under a mineral right, which includes application to the chief mining inspector 90 days before abandonment. If approved, then abandonment conditions should be adhered to. A certificate does not remove liabilities incurred prior to the certificate	Areas where mining has ceased may be abandoned but environmental liabilities need to be cleared
Section 87. Royalties	Requirements to pay royalties at the gross Value of Minerals	The Cooperatives at the sites should ensure that the gold recovered from the plant is subject to royalties
Section 95. Restrictions on the right of entry by the mineral right holder	Need consent from the LGA responsible and lawful occupier to exercise mineral rights for land within 200m of residential 100m from crop farms	The site is located within a natural woodland area outside the village

Legislation	Description	Relevance to the Project
Section 96. Be reasonable when exercising mineral rights	Ensure activities are not injurious to land occupiers or other land users Rightful occupiers not to hinder access or erect buildings without the consent of the mineral right holder Compensate for land disturbance/property damage	The site being within the PML and not being utilized for other purposes. It is off an established access road and within the site a track is already present
Section 97. Compensation, relocation, and resettlement	Fair and reasonable compensation in line with the Land and Village land acts at the current market value to be paid by mineral right holders cannot coexist with landowners without injuriously affecting them	The site selection process has eliminated this requirement as the PML and cooperatives have given the land freely. The project will use existing roads
Section 102. Provision of goods and services by Tanzanians	Mineral rights holders to have local content plans and follow up on HSE performance of their suppliers	The Cooperatives at the sites should ensure compliance
Section 105. Corporate Social Responsibility	Mineral rights holders to have a CSR plan that has been developed jointly with and approved by the LGA responsible for the host community and aligns with their priorities.	The cooperatives at the sites have engaged in community development activities that are priorities of the host communities and have an agreement with the village government
Section 107. Compliance with Environmental Principles	Mineral rights holders should comply with the environmental safeguards included in the Environment Management Act and other written laws Should contract a separate competent entity to manage wastes arising from operations who is permitted under the Environment Management Act 2004	The operations at the project sites demonstrated to follow some principles e.g., water recovery and circulation, but still improvement is needed. The project should implement measures to limit emissions and discharges, separate operational impacted water and enhance mercury recovery. This ESIA ensures compliance. The management of wastes proposed should align with the requirements
Section 109. Liability of the License holder for pollution damage	The license holder shall be responsible for pollution damage	The cooperatives operating the sites were aware that they are liable for environmental pollution by their activities but negligence was observed especially in dewatering and storm water management
Mining (Mineral Rights) Regulations 2018 reg 16	Each year to prepare a report on the machinery available, employees, wages, minerals	The project need to assign these responsibilities to the GOP administration

Legislation	Description	Relevance to the Project
Information and Reporting	produced, death and accidents and submit to the Mine Commission	
Mining (Designated Minerals Certification) Regulations 2019 Regulation 5. Classification and Certification of Mining Areas	Provides for inspection, classification and certification of Mining Areas as part of the International Conference of the Great Lakes Region (ICGLR) Pact for designated minerals that include Gold. These classes include: (a) Red-flagged, where there is presence of illegal mining; illegal processing and trading of minerals and active involvement of miners under eighteen years of age in mining activities; (b) (b) yellow-flagged, where mining or processing is legal, but there is lack of environmental management plan or protection plan; (c) (c) green-flagged, where infractions stated under paragraph (a) and (b) are not present.	The project to ensure that the selected sites do not fall under red category. Most of the sites visited fell under yellow category and hence the need for this ESIA
Mining (Safety, Occupational Health and Environmental Protection) Regulations 2010		
Regulation 20: Safety Precautions to be observed	Requires all persons working or supervising work at the mine to ensure safety of areas and equipment and also ensure that people are not exposing themselves to risks	The cooperatives should enforce the use of PPE and the following of procedures and that work is undertaken at the designated places
Regulation 70: Mercury retorts to be sealed	Requires retorts used for gold-mercury amalgamation to be tight sealed and seals to be tested and certified by a recognized bureau of standards	During stakeholder consultation, it was revealed that retorts are not used and amalgam separation is done via open burning
Regulation 196: Reclamation Requirement Standards	Requires license holders to undertake environmental protection and reclamation activities throughout the operational life which is aligned to these standards	There was no proper ESMP and closure plan that was followed at the sites. Processing areas no longer used were not rehabilitated and tailings and retort ashes were just staked on the ground with no drainage. The project should include drainage, tailings/retort

Legislation	Description	Relevance to the Project
		ashes and washwater viable solutions in its plan
Mining (Environmental Protection for Small Scale Miners) Regulations of 2010		
Regulation 3. Baseline environmental investigation and social study Regulation 4. Environmental Audit of Existing Workings Regulation 5. Review of EPP Regulation 6. Prohibition of pollution	Each PML should conduct a baseline environmental and social assessment or and Environmental Audit for existing facilities and submit an environmental protection plan (EPP). If the mining activities have significantly changed then review the EPP. It prohibits pollution and requires adherence to the Water Resources Act 2009 and Environmental Quality Standards as per Standards Act 2009	These regulations aligns with the requirements of the EMA 2004 and provides for standards that the project areas are currently following
Regulation 10. Settling Ponds Regulation 11. No vegetation clearing Regulation 12. Use of Retort Regulation 13. Abandoned workings to be backfilled or fenced Regulation 14. Tailings disposal Regulation 15. Children not to be employed Regulation 16. Pit latrines to be constructed Regulation 17. Protective gears to be used	These provide for protection of water sources from sedimentation and conservation of riparian vegetation. Requires closed retort system to be used when heating Gold/Mercury Amalgam. Making safe abandoned pits. They prohibit engagement of persons less than 18 years and require that PPE be used to limit contact with hazardous substances	Cooperatives and miners in the project areas were aware of these requirements however as there was limited enforcement PPE was sparingly used. There were no rehabilitation or safety measures put in pace for abandoned pits Workers looked to be of legal age and that was reiterated by the mine representative
The Explosives Act of 1963 The explosives regulations 1964	This governs import, transportation and use of explosives.	the blasting characteristics (materials used and patterns) will determine the size of the materials that will be mined and hence the need for manual sorting of rocks according to sizes and rock breaking which is mainly done by women.
Occupational Health and Safety Act of 2003 Part VI: Safety Special Provisions	This part requires risk assessments that cover people, property and environment be undertaken and management plans be implemented; employees	The facilities managers were not aware of requirement to undertake risk assessment. PPE was said to be provided however minimal uses and

Legislation	Description	Relevance to the Project
	not be exposed to harmful emissions; requires provision of PPE to employees exposed to hazards; and provision of eye protection in rock breaking activities	just of gumboots were observed. No measures were inplace to manage emissions from retort activities. And no eye protection was provided to the women breaking the rocks. Measures need to be included in the project to comply
Employment and Labour Relations Act of 2004		
Part II: Fundamental Rights and Protection	This part prohibits child labour, forced labour, discrimination and requires employers to promote equal opportunities	All the project sites stated that no child labour was present and it was not obvious however absenteeism in primary and secondary schools due to boys engaged to work at minesites was reported. Small children were noticed at the mines while their mothers were sorting and breaking rocks. There were norms for division of work according to gender
Part III: Employment Standards	Gives minimum requirements for hours of work, rest, holidays, fair renumeration and termination	As these sites operate not under regular working hours, the exemption of the mining sector and good practice guidance should be included in the Labour Management Plan and contractor documents
Environment Management Act of 2004		
Section 81. Obligation to undertake EIA EIA and Audit Regulations amended in 2018. Regulation 5. Application and Classification of Projects	Mining activities fall under category A and B1 projects of which EIA is mandatory	Currently the PMLs do not have EIA or EA certificates to govern their operations. This ESIA is being undertaken to ensure compliance as ASGM activities fall in category B1
EIA and Audit Regulations of 2005. Regulation 42. Developer to inform	Obligations to inform NEMC of changes in the project	The nature of operations at the PMLs where shaft operators and ores processing facilities are frequently onboarded and

Legislation	Description	Relevance to the Project
council of changes in the undertaking		develop shafts or close and abandon shafts may be difficult to continuously comply.
EIA and Audit Regulations of 2005. Regulation 46. Environmental Audit	Initial Environmental audits to be conducted on ongoing projects that commenced prior to coming into force these regulations	PML holders should undertake Initial Environmental Audits and have an ESMP that will be fit for their operations and covers all the operators on their land.
Industrial and Consumer Chemicals (management and control) Act 2003 Section 11(9) All chemicals appearing in the 6th Schedule shall require registration	Mercury and its compounds is included in the 6th Schedule as a chemical that are hazardous to the environment	The project should ensure that the cooperatives operating the sites comply as they were not registered
Industrial and Consumer Chemicals (management and control) Regulations of 2020 Regulation 24. Requirements for chemical users and producers Regulation 27. Requirements for storage of chemicals	ASGM (described as special group in first schedule item 2(1)using and storing chemicals need to be registered; Ensure the public is aware of the inherent nature of the chemicals handled at their sites; and, adhere to the code of practice and guidelines on the safe handling and use of chemicals	The project should ensure that the cooperatives operating the sites comply as they were not registered
Water Resources Management Act 2009		
Section 23: Powers and Functions of Basin Water Boards	Bodies responsible to issue, revoke and monitor water use and discharge permits, and pollution prevention measures	The responsible water board should monitor runoff and discharges from sluicing pits these sites and encourage implementation of pollution prevention measures

2.2 Relevant Regional and International Conventions

2.2.1 International Conference on the Great Lakes Regions (ICGLR) Model Law 2012

"The prevention and Suppression of the Illegal Exploitation of Minerals in the Great Lakes Region Act", known as "Model Law" was developed in order to domesticate the "Regional

Initiative against the Illegal Exploitation of Natural Resources" (RINR) that was agreed by the countries forming the Great Lakes region launched in 2009 and then agreed as a Protocol on the Illegal Exploitation of Natural Resources in the Great Lakes Region in December 2010 as part of the Lusaka Declaration. The ICGLR include Angola, Burundi, Central African Republic, Democratic Republic of Congo, Kenya, Republic of Congo, Rwanda, Uganda, Sudan, Tanzania and Zambia that was launched in 2009. The RINR outlines specific actions needed to translate the Great Lakes region's rich mineral resources from a source of conflict into a catalyst for development. The Model Law has focused on the Conflict minerals (3T and Gold); OECD Due diligence; and Regional Certification aspects of the Protocol as already the member states had legal instruments governing responsible mining. Tanzania localized this protocol in 2019 through the Mining (Designated Minerals Certification) Regulations 2019. The project should make sure that measures to prevent child labour and traceability records are implemented by the cooperatives who will operate the facilities to align with the requirements of this protocol to enable the projects not be classified as Red Areas.

2.2.2 World Bank Environmental and Social Standards (ESS) 2018

As this project is funded by the World Bank, it has developed an Environmental and Social Commitment Plan which has highlighted the applicable ESS as ESS1, 2, 3, 4 and 10 as the others were removed by the site selection and screening process:

ESS 1: Assessment and Management of Environmental Risks and Impacts

As this is a component 3 project an ESIA and ESMP are mandatory and environmental and social risks will be assessed through the use of E&S screening tool provided in the ESMF. All the 4 project sites are located in active mining operations and most of the risks and impacts are already preexisting and limited additional impacts are envisaged due to the implementation of the project. The project aims to influence adoption/improvement of mitigation and management measures. The project Labor Management Plan, Stakeholder Engagement Plan and Grievance Redress will form part of the ESMP. Contractor management tools included in the ESCP will also be included. The WB General EHS Guidelines and those specific for mining will inform the standards and practices that will be adopted.

ESS 2 Labor and Working Conditions

A Labor Management Plan for the project has been developed and will be included in the ESMP. Grievance mechanisms that are easy to implement and improve the current practices observed in the field which were commended by stakeholders not to be very effective as recommended by the beneficiaries and vulnerable groups will be included in the ESMP. Practicable Occupational Health and Safety measures that can be adopted to reduce exposure and release of mercury will be recommended in the ESMP.

ESS 3: Resource Efficiency and Pollution Prevention

The technology selected to limit generation of waste and limit pollution. A waste management plan to be part of the ESMP to govern contractor and cooperatives who will operated the pilots that is based on WB General EHS and specifically Mining and Waste Management Facilities.

ESS 4: Community health and Safety

Issues of traffic management and emissions impacts have been identified and included in the ESMP. Information pertaining to gender issues including Gender based Violence and child (exposure to hazardous conditions including employment and abuse) were collected during the stakeholder engagement and have informed the impact identification, assessment and will form part of the ESMP

ESS 10: Stakeholder Engagement and Information Disclosure

The project has developed a Stakeholder Engagement Plan that was followed during the preparation of this ESIA and will be included as part of the ESMP

2.3 Administrative Framework

2.3.1 Environment Management Administration Framework

Currently, the administrative framework for environmental management is as described in Part III of the Environment Management Act of 2004. However, this project also encompasses issues relating to labour chemicals, and occupational health and safety and hence its administration framework is as adopted from the ESCP.

Table 2-2: Institutional Arrangement for Environmental Management

Institution	Role
National Environment Management Council (NEMC)	The National Environment Management Council (NEMC) will be the primary agency responsible for the satisfactory implementation and monitoring of the ESMF. In doing this, NEMC will work in close association with relevant regional, district or local level – the Local Government Authorities (LGA). As per Environmental Management Act No. 20 of 2004, NEMC will be responsible for review and monitoring of Environmental Impact Assessments (EIA), and enforcing compliance to the project approved ESMP
Vice President's Office (Division of Environment)	This Division has the overall responsibility of planning and implementation on all environmental matters, including approvals of SEA and EIA certificates. It also formulates environment management regulations and provides related permits i.e. Hazardous Waste Management Permits
Ministry of Minerals (MoM) Through the Mining Commission (MC) which has officers at Regional (RMO) and project site (MRO) level	• Enforce the requirements of Mining Act RE 2019 and EMA 2004 by requiring EPP and EIA to form part of PML license applications • Enforcement of laws and regulations for mining and protection of environment in all licensed areas; • Environmental monitoring and auditing of the various exploration and mining activities; • Mining projects EIS & EMP approvals (through a multi-sectoral committee under the NEMC); • Managing resettlements in Mining areas (through the Ministry of Lands and Housing Settlements); and • Mining conflict resolutions.
Presidents Office – Local Government and Regional Administration	**Regional Level** Advice on environmental implementation and enforcement of legislation to the project operations **District Level** The District Commissioner as the Chairperson of the District Security Committee is responsible for ensuring security and also resolution of grievances The District Environment Management Officer (DEMO) is responsible for environmental matters in the district. This includes issuing non hazardous waste permits and inspection of facilities

Institution	Role
	within the distict. He is the main connection between the district and NEMC and VPO-Environment The District Social Officer is responsible to follow up on gender and youth matters The District Community Development Officers registers and follows up on establishment of cooperatives and development groups in the district **Ward and Village Levels** The Village Executive Officer and Ward Executive Officers are responsible for receiving, organizing for resolution forums and escalating grievances to the district level
Occupational Safety and Health Authority	OSHA was set up in 2001 under the Ministry of Labour, Youth, Employment and Persons with Disability to administer occupational health and safety at workplaces in the country. This Ministry is the main actor with the oversight role of ensuring that decent work is practiced and maintained in Tanzania. It provides directives, technical advice, enforces legislations, proposes amendments, allocates resources, oversees all activities carried out by OSHA and ensures that OHS rules and regulations are adhered to and maintained at workplaces.
Basin Water Boards	They appoint members and chairperson of catchment and subcatchment committees which are responsible for management of water sources. Responsible to monitor pollution and subsequent prevention measure
Government Chemist Laboratory Authority (GCLA)	GCLA is under the Ministry of Health and it is mandated to ensure that all chemicals that are imported and used in the country are regulated. This includes issuance of importation and transport permits. Mercury is one of such chemicals that are regulated.
NGOs and Miners Associations	The Governments' drive to formalize prospecting and Primary Mining Licenses and to stimulate formation of associations of small-scale miners has been effective in giving the small-scale sub sector a stronger voice and further influence over policy, legislation and implementation procedures. The influence of individual societies, associations, faith groups and other organizations is recognized by government and the mining sector and some bodies, like the Lawyers Environmental Action Team and Policy Forum have played key roles in advocating changes to recent draft legislations. Other groups (TAWOMA, AFWIMM, and WIMA) have lobbied for fairer treatment of women miners and processors.
Project Site	The Mine Manager and his assistants, the HSE Officer and Fundi are overall responsible for the day to day welfare of employees. Mine Resident Officer (MRO) who oversees all operations on behalf of Mining Commission is always on site and ensuring compliance to HSE requirements forms part of their portfolio

2.3.2 Administration at the ASGM Sites

Administration at ASGM sites is usually through a group or cooperative who may or may not be the PML holders but work under the PML holder under a profit-sharing agreement. As per Mining Act RE 2019 and subsidiary regulations, each mine site has an appointed Mine Manager and hence the cooperatives have appointed such a person. Any person wishing to mine in the area would apply to the designated manager of the cooperative/group who will present it to the members for approval/disapproval. Once allowed to operate in their area, the

person is provided a portion of land where they can operate (develop a mining shaft to extract ore and in cases also construct processing facility) and then a formal agreement is drawn where the person is to provide a portion of the ore mined or gold recovered to the cooperative as rent and in cases required to use the processing facilities onsite and leave the tailings behind as payment of tenure.

Daily productions of each shaft and processing facility are followed up on and recorder by the Cooperative Manager. The manager is assisted at minimum by two personnel a Health, Safety and Environment (HSE) Officer and Fundi. The HSE Officer is responsible to ensure that minimum HSE requirements provided under the PML are followed by each operator. The Fundi is responsible for ensuring that reinforcement of shafts and tunnels is done according to standards (as per experience) is undertaken at each operational area and controls the number of employees operating within the area. Each operational area has a supervisor who looks after employees welfare and collects operational information to provide to the shaft/process plant owner and the cooperative manager. Each PML cluster area has a designated Mines Resident Officer (MRO, an employee of the Mining Commission) onsite to follow up on production and safety. All PML cooperative managers provide daily reports to the Mines Resident Officer

3 Project Description

3.1 Project Location and Accessibility.

Vicent Benedicto Busiga Site is located at coordinates (03°49'28.0992"S, 032°06'59.4576"E) administratively being within Mwabomba Village, Idahima Ward in Kahama district, Shinyanga Region as indicated on Figure 3-1.

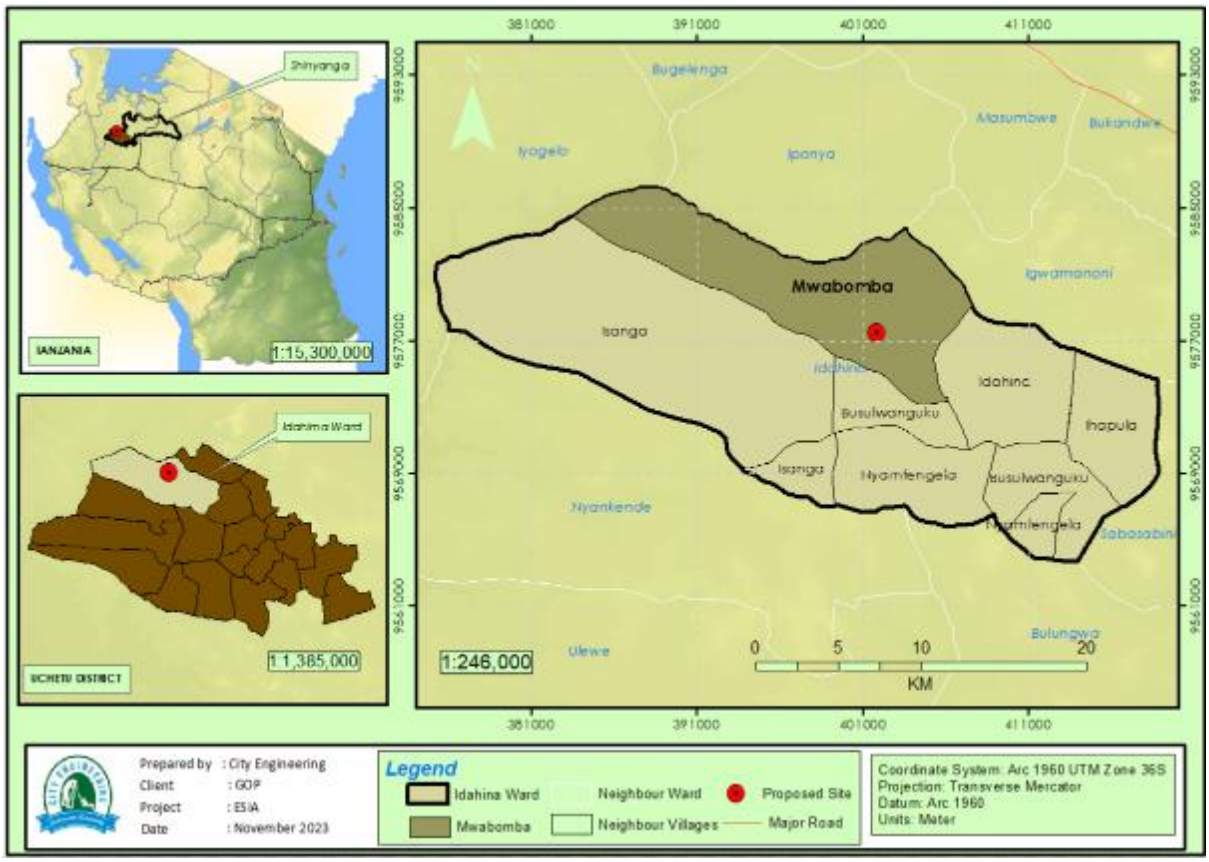


Figure 3-1: Administrative Location of Mwabomba Site Owned by Vicent Benedicto Busiga

The site can can be accessed by driving north on the main Kahama to Rusumo highway about 55kms from Kahama town to Masumbwe Center (Geita Region) and then south through a 23kms all weather earth road to Mwabomba Village.

3.2 Land Ownership and Land use

The area provided by the PML owners for construction of the Gold Ores Facility is within an area used exclusively for gold mining and processing. It is within a woodland area with patches cleared to support different mining, processing, ore and tailing storage for the various shafts operated by the different family members. The specific site consists of partly cleared land that was formerly used to store ore and tailings shown on Figure 3-2. At the back of the site is a sluicing plant that is currently not used (Informed the owner had temporarily ceased activities) and on the far end is a mining shaft. To the sides it is open woodland. The site representative informed that the area provided is about 70m long and 40m wide but if additional land is needed it can be expanded.

Surface right ownership is by the family who also own the PMLs. The site representative informed the team that they have a title deed for the area and there was no land ownership conflict. Adjacent to these PMLs, there are other mining sites.

Figure 3-2: Appearance of Mwabomba Site Proposed to accommodate the Gold Ores Plant

3.3 Ore Mining

The mining operations at Vincent Benedicto Busiga site started in year 2000 and has been operational to date. The mining method is underground with more than 200 mining pits (Maduara), where 50 are active. The underground mine pits developed have an average mining depth ranging from 10M – 50M. The daily mining production rate is 80 tonnes/week of gold ore, equivalent to 1000bags each of 80Kg/week.

3.4 Current Gold Processing Operations

This facility is designed for processing 1-2 tons of ore per hour (tph), suitable for small scale ASGM operations. The flow involves size reduction, gravity separation, washing, amalgamation, and safe handling of hazardous materials like mercury

1. **Crushers**

These robust machines form the first critical step in the processing chain. Their function is to break down large, raw ore into smaller, manageable fragments, liberating gold particles from the surrounding rock for subsequent recovery. In this specific facility they are operated at a feed rate to consistently supply the downstream system, which is designed for a steady 1 to 2 tons per hour.

2. **Sluicing Box**

Acting as the primary gravity concentration unit, the sluice is where the first major separation of gold from waste material occurs. Crushed ore mixed with water is channelled down this 3-meter-long, 0.4-meter-wide inclined plane. Set at a slope of 10 to 15 degrees, the flow velocity is calibrated so that dense gold particles settle and are trapped behind riffles, while lighter gangue material washes away. Its dimensions are precisely engineered for the plant's target capacity of 1 to 2 tons of ore per hour.

3. Washing Bay & Settling Pond

This large, concrete basin serves a dual purpose. Primarily, it acts as a secondary washing and manual concentration area for material from the sluice. Equally important is its role as a settling pond, where the fine silts and particles suspended in the wastewater are given time to settle out before the water is reused or released. Measuring 7.5 meters long by 2.5 meters wide and 1.2 meters deep, its substantial volume is necessary to handle the slurry and effluent generated from processing 1 to 2 tons of ore hourly.

4. Collection Water Pond

Located to capture overflow from the washing bay, this pond is the facility's water recycling hub. It stores clarified water after the majority of solids have settled out, allowing this vital resource to be pumped back into the process circuit. This conservation measure is essential for sustainable operation. At 3.88 meters long, 2.35 meters wide, and 1.2 meters deep, its capacity is scaled to manage the hydrological balance of the 1 to 2 tons-per-hour operation.

5. Panning and Amalgamation Pool

This dedicated two-compartment pool is where the concentrated material from the sluice undergoes final upgrading and the hazardous process of mercury amalgamation. The first, deeper compartment (900mm) is used for careful planning to produce a high-grade concentrate. The second, shallower compartment (700mm) is specifically for introducing liquid mercury, which binds with the fine gold to form an amalgam paste. Each compartment measures 2.5 by 2 meters, providing a confined, controlled workspace for these critical and delicate tasks.

6. Amalgam Burning Chamber/Room

This specially designed enclosure is for the high-risk process of separating gold from the mercury-amalgam. Inside this 3.35 by 2.675 meter room, the amalgam is heated, causing the mercury to vaporize and leaving behind crude gold. The chamber's design prioritizes operator safety and pollution control through forced ventilation or fume capture systems to prevent the release of toxic mercury vapor, processing an estimated 1 to 2 kilograms of amalgam per batch.

7. Water Storage Tank

This tank is the plant's primary clean water reserve, ensuring a reliable and consistent supply for all washing and processing stages independent of immediate external sources. With a holding capacity of 3,000 liters, it acts as a buffer and supply for the continuous operation, directly supporting the processing of 1 to 2 tons of ore each hour.

8. Water Pump

The circulatory system of the facility, this pump is responsible for moving water throughout the plant. Its key specification is an 8-meter head, meaning it has sufficient power to lift water from the collection pond to the highest point of the sluice or crusher feed, overcoming elevation differences within the plant's layout to maintain the necessary flow and pressure for efficient operation.

9. Mercury-Contaminated Tailings Storage Area

This secure containment area is a critical environmental control and intermediary storage feature. All waste sands and sledges that have come into contact with mercury primarily from the amalgamation pool, are collected and stored here to prevent immediate environmental contamination. Measuring 3.6 by 3 meters and featuring drainage channels, it is designed to be impermeable, safely containing the hazardous tailings produced from the amalgamation process. **In the long-term operational plan, these stabilized tailings are scheduled for transfer to Carbon-in-Pulp (CIP) plants for residual gold recovery, with the final, inert waste destined for secure, engineered Tailing Storage Facilities (TSFs) associated with the CIPs operation, ensuring ultimate environmental safety**

A summary of the components is as indicated in table 2.1 below

Table 2.1: Project facility and capacity

Component	Function	Size / Specifications	Capacity / Throughput
Crushers	To break down large ore into smaller fragments, liberating gold particles for recovery.	Industrial scale unit	Rated 1–2 tph
Sluicing Box	Primary gravity concentration; separates gold from waste using flowing water over an inclined plane.	3 m long × 0.4 m wide, slope: 10–15 degrees	Designed for 1–2 tons of ore per hour.
Washing Bay & Settling Pond	Dual-purpose: secondary washing/manual concentration and sedimentation of fine particles from wastewater.	7,500 mm × 2,500 mm × 1,200 mm (L × W × D)	Handles slurry from 1–2 tph ore processing.
Collection Water Pond	Stores clarified water from settling pond for recycling within the system.	3,880 mm × 2,350 mm × 1,200 mm (L × W × D)	Manages water flow for 1–2 tph operations.
Panning & Amalgamation Pool	Final concentration via panning and mercury-based amalgamation in a controlled environment.	Two compartments: each 2,500 mm × 2,000 mm; depths: 900 mm & 700 mm	Processes concentrates from 1–2 tph ore feed.
Amalgam Burning Chamber	Safely vaporizes mercury from the gold-amalgam using heat; includes ventilation/fume control.	3,350 mm × 2,675 mm; ventilated design	Estimated 1–2 kg of amalgam per hour.
Water Storage Tank	Holds clean water supply for entire washing and processing circuit.	Capacity: 3,000 liters	Supports continuous 1–2 tph operation.

Component	Function	Size / Specifications	Capacity / Throughput
Water Pump	Circulates water from collection pond or tank to crusher and sluice inlet.	Pump head: 8 meters	Maintains flow and pressure for 1–2 tph feed.
Mercury-Contaminated Tailings Storage	Secure containment for tailings with residual mercury; prevents soil/water contamination.	3,600 mm × 3,000 mm; includes drainage channels	

3.5 Human Resources

As common in gold rush mining areas and as described in Section 2.3.2, the framework supports the use of migrant temporary labour. Currently the Mwabomba site has more than 5000 people involved in daily small-scale mining operations. There is only one permanent employees who is both the Mine Manager and the HSE Officer. Most of the workers engaged do not have formal contract and are paid a day wage which is also attached to performance targets.

For the Gold Ores Construction, the Labour Management Plan (LMP) has estimated that

- 10 employees will be needed to construct each washbay in each region
- 20 employees will be needed to construct the VAT Leaching Plants in each region
- 30 employees will be needed for rehabilitation of degraded mining areas in each region (these will be the same used for site clearance)
- 15 employees will be needed for tree planting in each region
- 20 employees will be needed for fabrication work

Hence assuming that the same crew will work at both sites in the region hence the total labour requirement at the Mwabomba site will be 95.

It has been decided that migrant workers will be limited and contracting will be done locally. Also the few skilled workers e.g. construction supervisors and fabrication crew will not be housed onsite but will seek rental accommodation within proximity.

3.6 Water Sources

The water used for gold ore processing operations is obtained mainly from a private well downstream of the site called Lyabukande Well. This was said to be the only water source for the village. In cases water was obtained from the mining shafts.

3.7 Waste Management

Domestic wastes at the minesites are either disposed off onland or in shallow pits. Limited recovery of plastics especially water bottles is done as the team stated there is no market. From time to time scrap dealers from the nearly Masumbwe centre come to the village and purchase scrap metals and hard plastics.

3.8 Environmentally Sensitivity:

The area consists of natural forest which is moderately disturbed which is being subsequently cleared to make way for mining. It is about 6kms from the eastern boundary of Kigosi game Reserve. No environmentally sensitive areas, i.e., rivers, lakes, springs, forest reserves etc., are within 60M or near the mining sites.

4 Baseline Data

This chapter provides information on the relevant environmental baseline for the project site which with implementation of the project may be either positively or negatively impacted and will form the basis of the environmental and social risks and impacts assessment.

4.1 Climate

Kahama has a tropical savannah climate with one rainfall season. The wet season is warm, humid, and overcast and the dry season is hot, windy, and partly cloudy. Weather data from 2018 to 2022 recorded from Kahama and Shinyanga was provided by PIT and it is what is used to describe the climate.

4.1.1 Temperature

From the dataset provided, the average temperature at Kahama ranges from a minimum of 17^0C to a maximum of 32^0C. The hottest month being October and the coldest month being July.

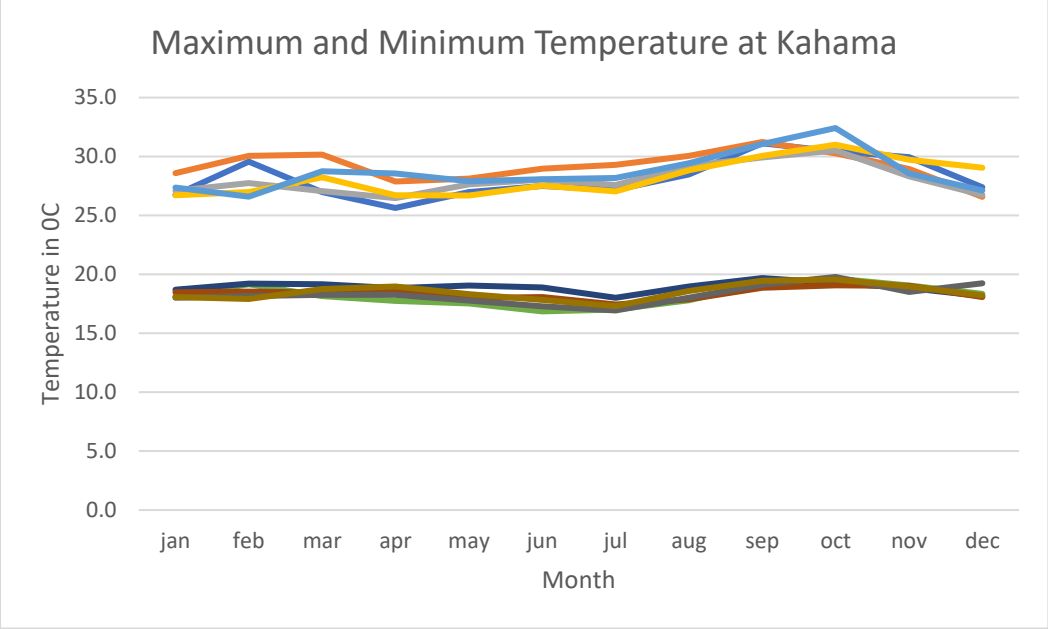


Figure 4-1: Temperature Patterns at Kahama

4.1.2 Rainfall

Kahama falls into a region with one high rainfall maxima. The rain season starts in October all the way to May and the dry season from June to September with almost no precipitation at all.

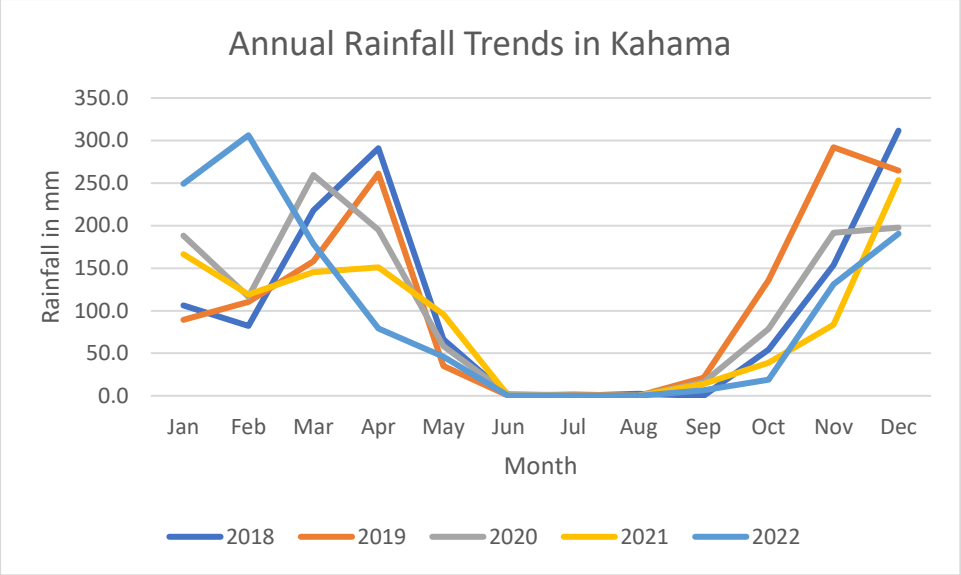


Figure 4-2: Annual Rainfall Patterns at Kahama

4.1.3 Evaporation

On average, the rates of evaporation in Shinyanga exceed precipitation.

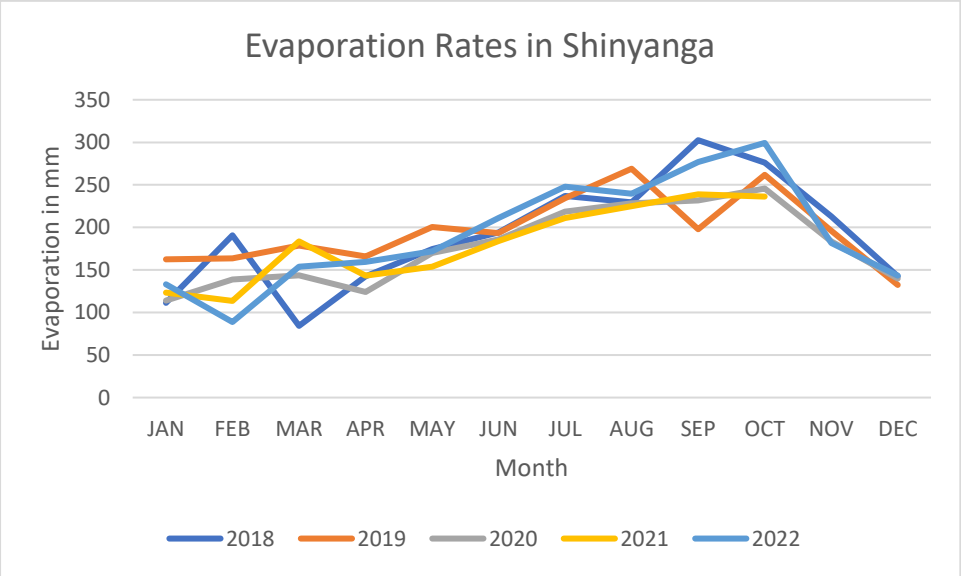


Figure 4-3: Evaporation Rates recorded in Shinyanga

4.1.4 Wind Speed and Wind Direction

The average annual windspeed for Kahama is depicted in Figure 4-4 indicating that winds consist of light air 1 – 2 Knots (0.5 – 1 m/s) at the beginning of the year and gradually increase to a gentle breeze with a maximum of 6 knots (3 m/s) during the middle of the year.

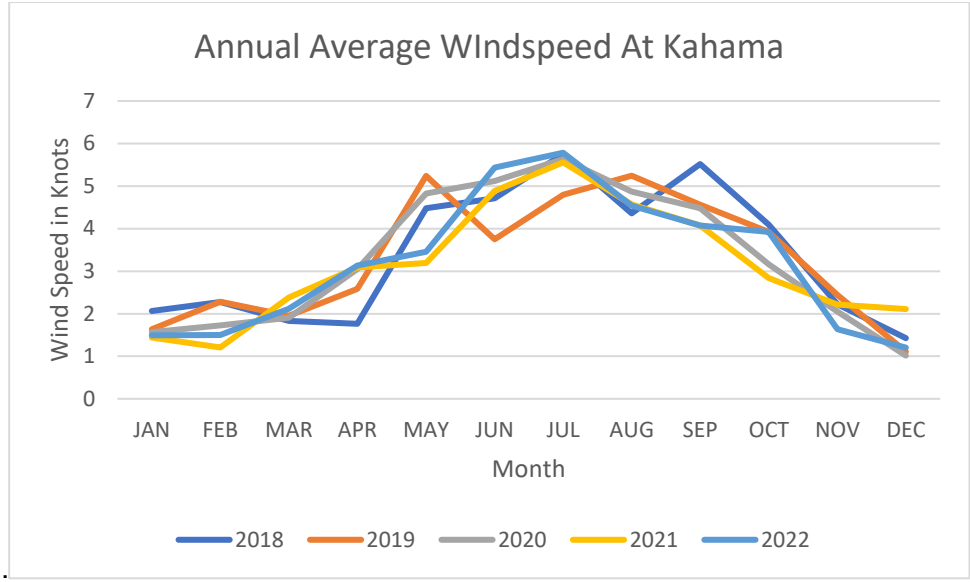


Figure 4-4: Wind Speed at Kahama

Predominant winds blow from the South East to the North West

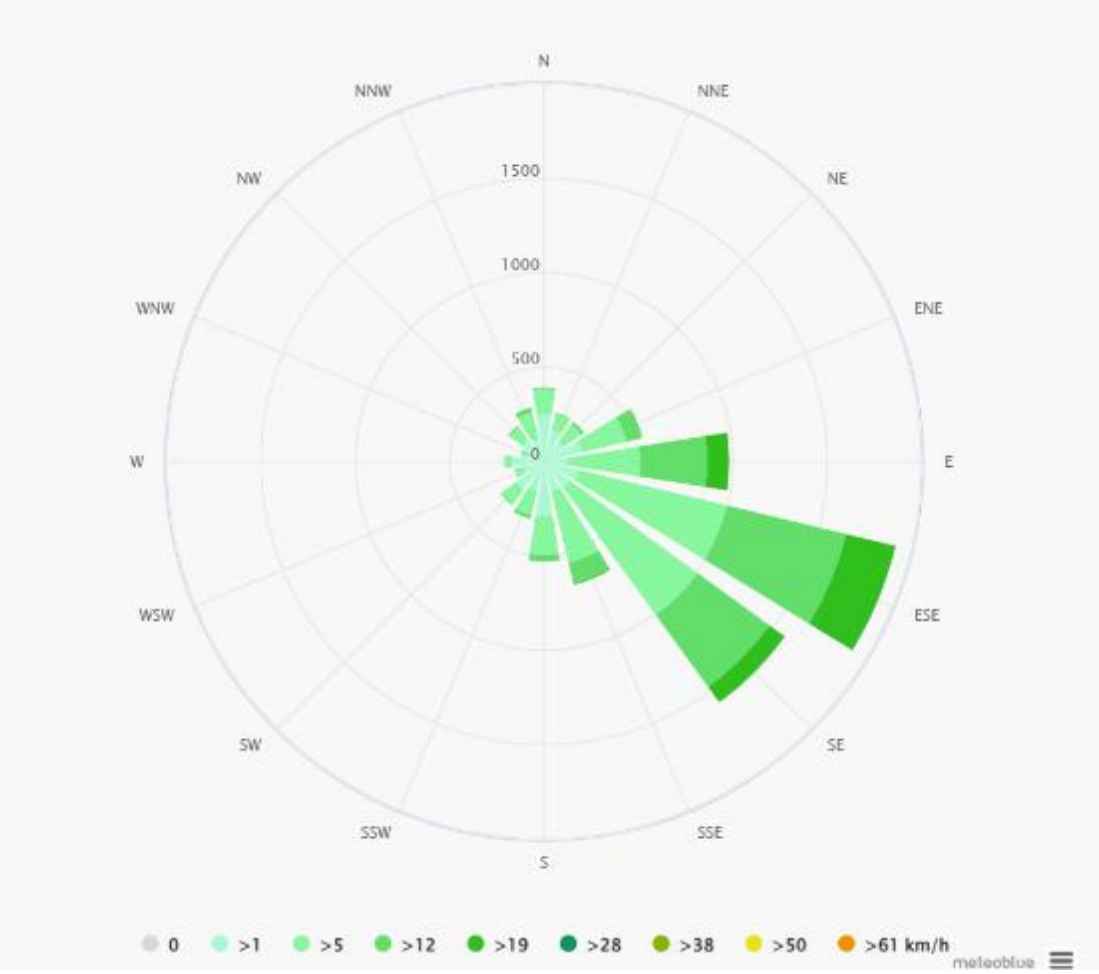


Figure 4-5: Wind direction for Kahama (Source: [Simulated historical climate & weather data for Kahama - meteoblue])

4.2 Topography

Kahama district which is a northern western plateau of Tanzania. It mainly situated 1250m above sea level with flat and gentle slopes which impact on drainage that usually ends in lowlands with limited distinct water channels.

4.3 Geology and Soils

Surface soil samples were taken by the PIT at four points in Mwabomba (Mbogwe S22, Mbogwe S23, Mwabomba S20 and Mwabomba S21) and tested for Mercury, Lead, Copper and Cadmium. The level of mercury at all points was below the detection limit of 5 mg/L. However the contaminant limit for Mercury is 2 mg/kg which is lower than the method detection limit making it difficult to comment on the current soil quality. Levels of Cadmium that were above standards were recorded at Mwabomba S20 point.

4.4 Seismicity

Eastern and Southern Africa cover a region prone to a significant seismic hazard due to the presence of the East African Rift system. The Seismicity Hazard Map developed by GEM Foundation and the METEOR Project Consortium included in Figure 4-6 shows that Kahama area is in an area with low seismic potential and the potential ground accelerations are less than 0.05g.

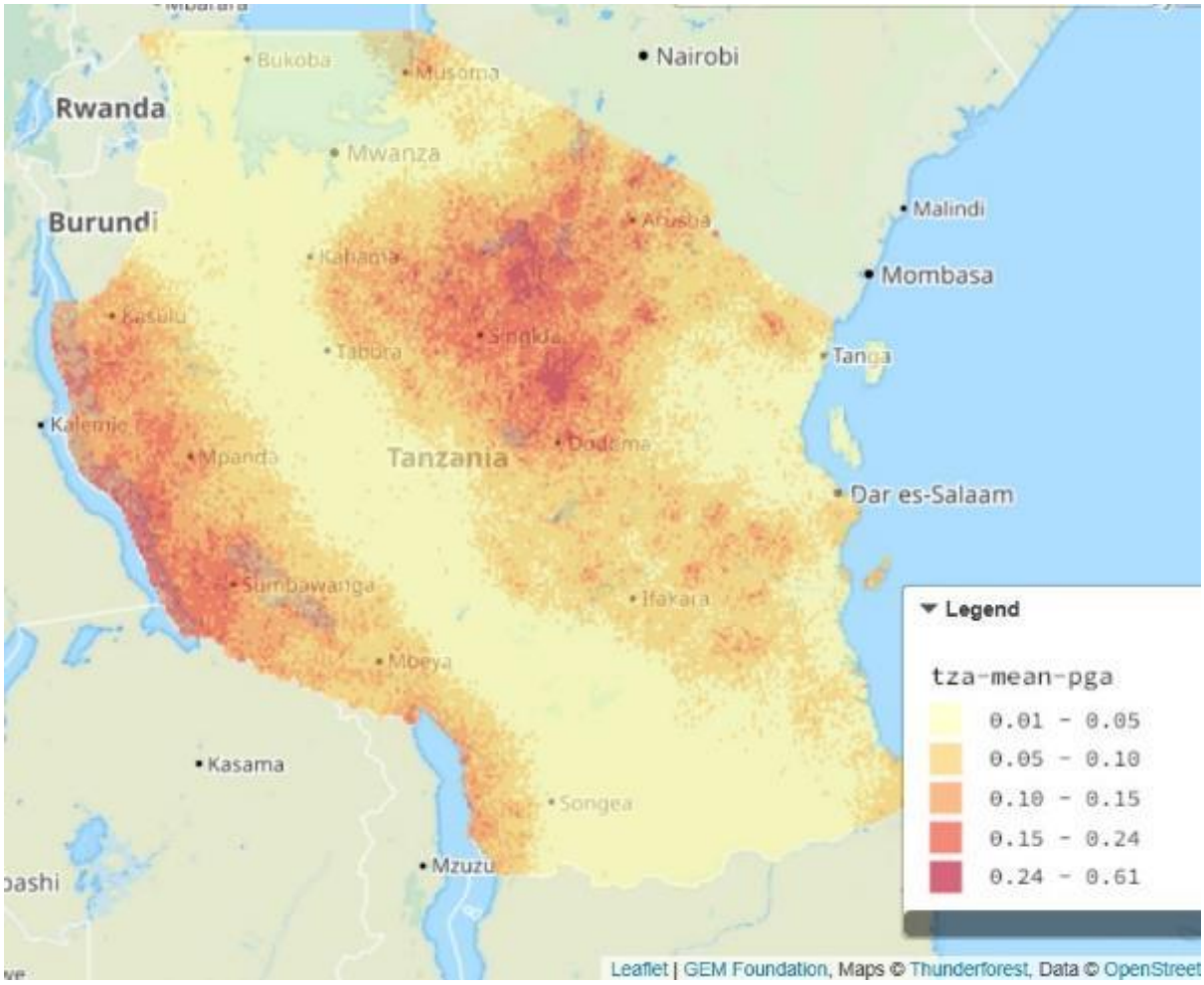


Figure 4-6: Tanzania Seismicity Hazard Map (Source: [METEOR Explorer - Tanzania Seismic Hazard Map (meteor-project.org)])

4.5 Flora and Fauna

Biodiversity baseline of the project site was established through onsite survey, interviews with locals, Focus Group Discussion, Opportunistic Sampling, and review of documents relevant to the project and locality.

The types of vegetation observed in Mwabomba include Miombo woodland vegetation within the project site, and Settlements with alien plant species, and Cultivations outside the project area. The vegetations are of social-economic benefits that the local residences use them as source of firewood at their homes and in the mining area, building poles, provides shades, timber for strengthening mining shafts. There were no species of conservation concern encountered in the project site however.

4.5.1 Miombo woodland

This vegetation is characterized by the presence of Miombo species mainly Brachystegia species including Brachystegia sp, and Combretum sp. The Brachystegia species in the project site included *Brachystegia bussei, B. boemii,* and *B. spiciformis* as shown on Figure 4-7. Brachystegia species were rare the preferred timbers for use in shaft reinforcement due to their hardness and roughness nature, offers safety from slipping during entering and getting out of the tunnels as such the species were highly exploited in such as way few matured species were observed, while others were regenerating. As such the miners largely depend on timber from the neighbouring regions of Kigoma and Tabora. Even though the site reported not to have a rehabilitation plan native vegetation were retained as there was no clearing on sites not needed for mining and in cases done within the trees indicating Flora conservation consideration despite the ongoing disturbances of mining activities.

Figure 4-7: ***Miombo Woodland at the Vicent Busiga Site in Mwabomba showing abandoned and active mining within***

Source: City Engineering Co. Ltd – Site Visit, November 2023

4.5.2 Settlements with alien plants

The vegetation type was dominated with infrastructure and alien plant species. The alien plant species has ability of becoming invasive species when they displace the native vegetation and resulting into remarkable and irreversible impacts (CBD, 2005). The vegetation was found outside the project area. The common alien plants included *Senna siamea,* and *Mangifera indica*. The vegetation provides accommodation, fruits and shades. However, the site survey was conducted during the onset of rainy season. Therefore, the site was still dry, and highly disturbed with livestock grazing. Hence, few invasive aliens plant species were observed (Figure 4-8).

Figure 4-8: Left - Calotropis procera, the Allien invasive plant and Right - Borassus aethiopium in Mwabomba village representing high water table observed during survey in Mwabomba village

Source: City Engineering Co. Ltd – Site Visit, November 2023

4.5.3 Cultivated land

This is a vegetation type where natural vegetation has been removed and being replaced with annual or perennial crops. It was mainly observed outside the project core site. According to the local residences, the vegetation is among the key income generating source apart from mining activities.

Figure 4-9:: Farms adjacent to Mwabomba project site: Crops; Ipomoea batatas, Zea mays, Percea americana

Source: City Engineering Co. Ltd – Site Visit, November 2023

Different crops and horticultural products are cultivated; cotton (*Gossypium herbaceum*), tobacco (*Nicotiana tabacum)*, cassava *(Manihot esculenta)*, Sweet potatoes (*Ipomoea batatas)*, *Mangifera indica,* banana (*Musa species), Zea mays,* Avocado (*Percea americana*) and beans (*Phaseolus sp*). Tobacco (*Nicotiana tabacum)* is among the crops grown as cash crop and have a significancy economic contribution to the local residences and the district.

4.5.4 Fauna

Neither small nor large animals were observed on the project site. The interview with local residences reported limited presence of fauna even though the site is wooded and within proximity to Kigosi Game Reserve (about 6 kms away). The site condition was fair with frequent movement of both human being and livestock along with the ongoing mining activities among the other which presents poor habitat for fauna to dwell. Interview with local people reported the presence of green snakes, puff adder, and African hare. All the identified animals in the project site fall in the Least Concern (LC) ecological status as per The International Union for Conservation of Nature's Red List of Threatened Species classified as "least concern" are not a focus of conservationists because they do not appear to be facing any imminent threats.

4.6 Water Resources

This section provides a description of the current state of water resources within Mwabomba project area. It involved an assessment of water quality data provided by NEMC, and topography to determine flows and quantity providing an essential benchmark against which potential impacts of the proposed project can be evaluated. By establishing a thorough understanding of the existing conditions, the baseline data not only informs effective mitigation strategies and management plans but also ensures regulatory compliance.

4.6.1 Hydrology and Surface Water Resources

4.6.1.1.1 Regional Hydrology

The study area falls within the boundaries of the Lake Tanganyika Drainage Basin. The basin has an approximately area of 223,000 km^2 and extends for 647km in a north-south direction and averages 50k in width. The topography varies, encompassing highlands, plateaus, and low-lying areas, which directly influence the hydrological cycle. The Lake Tanganyika Basin receives rainfall throughout the year, with an average annual precipitation ranging between 900 to 1200 millimetres. Rainfall patterns are influenced by the intertropical convergence zone and the presence of large water bodies like Lake Tanganyika. Figure 4-10 shows the boundaries of the Lake Tanganyika basin and its subbasins.

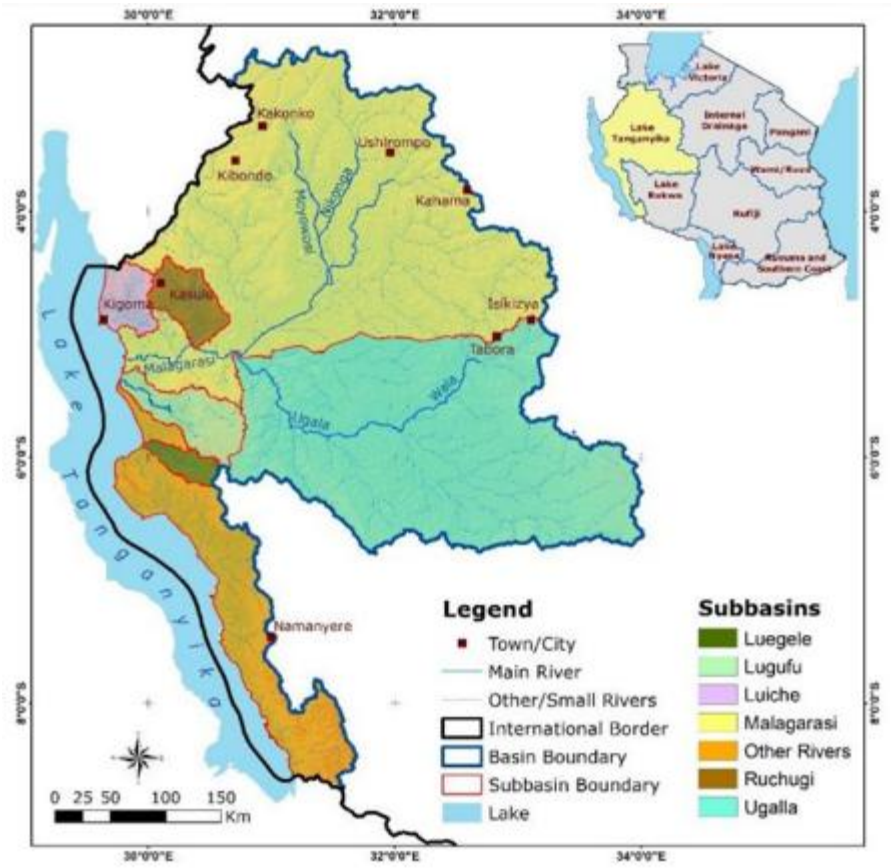


Figure 4-10: Lake Tanganyika Drainage Basin

Source (Tanzania Ministry of water)

Lake Tanganyika basin is subdivided into seven subbasins, the specific area of study is located within the Malagalasi subbasin. The notable hydrological feature in the Malagalasi subbasin is the Malagalasi river which receives water from various streams, tributaries, wetlands as well as other small rivers including Moyowasi and Nikonga rivers. As the dominant river in the area, Malagalasi acts as a conduit for water drainage from the surrounding land, channelling the flow towards Lake Tanganyika its ultimate destination.

4.6.1.2 Mwabomba Area Drainage

Figure 4-11 shows the boundaries of the Mwabomba watershed which was delineated using ArcGIS software and a digital elevation model (DEM) with a resolution 30x30m. The watershed

features a network of seasonal streams, converging into a sprawling wetland that extends across the landscape on the southwest of the watershed. The wetland, characterized by its seasonal fluctuations, serves as a vital nexus where these ephemeral streams collectively discharge. Stretching over a considerable distance, the wetland interfaces with larger streams, eventually contributing to the flow of significant small rivers within the Malagalasi sub-basin. The rivers later join the Malagalasi river and flows toward the Lake Tanganyika. This intricate hydrological system plays a crucial role in the ecological dynamics and water management of the broader Malagalasi sub-basin.

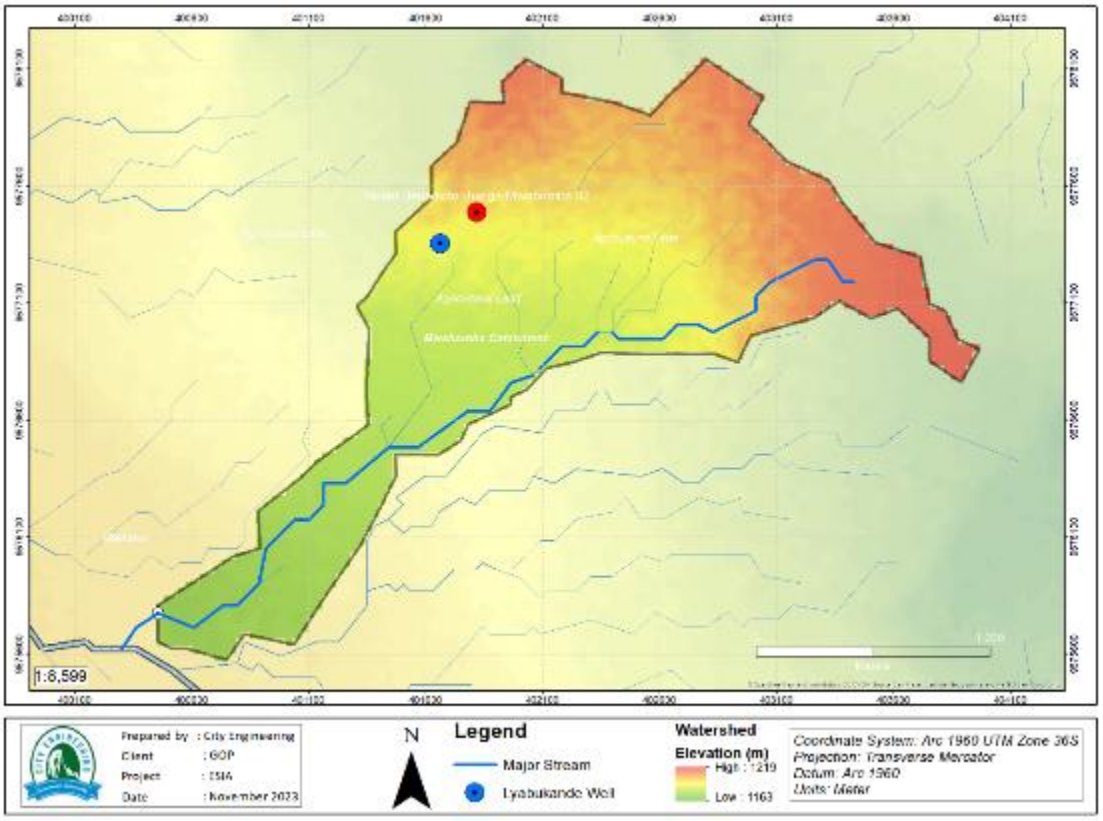


Figure 4-11: Mwabomba Watershed

Source (CECL)

In the vicinity of the Mwabomba site there is a distinctive surface water resource in the form of a riparian wetland as shown in Figure 4-12. All the streams of the Mwabomba watershed discharge its water into this wetland. The wetland extends over a short distance, with streams emanating from and extending beyond its boundaries. The riparian nature of this water resource highlights its close connection to the surrounding landscape, serving as an interface between terrestrial and aquatic ecosystems.

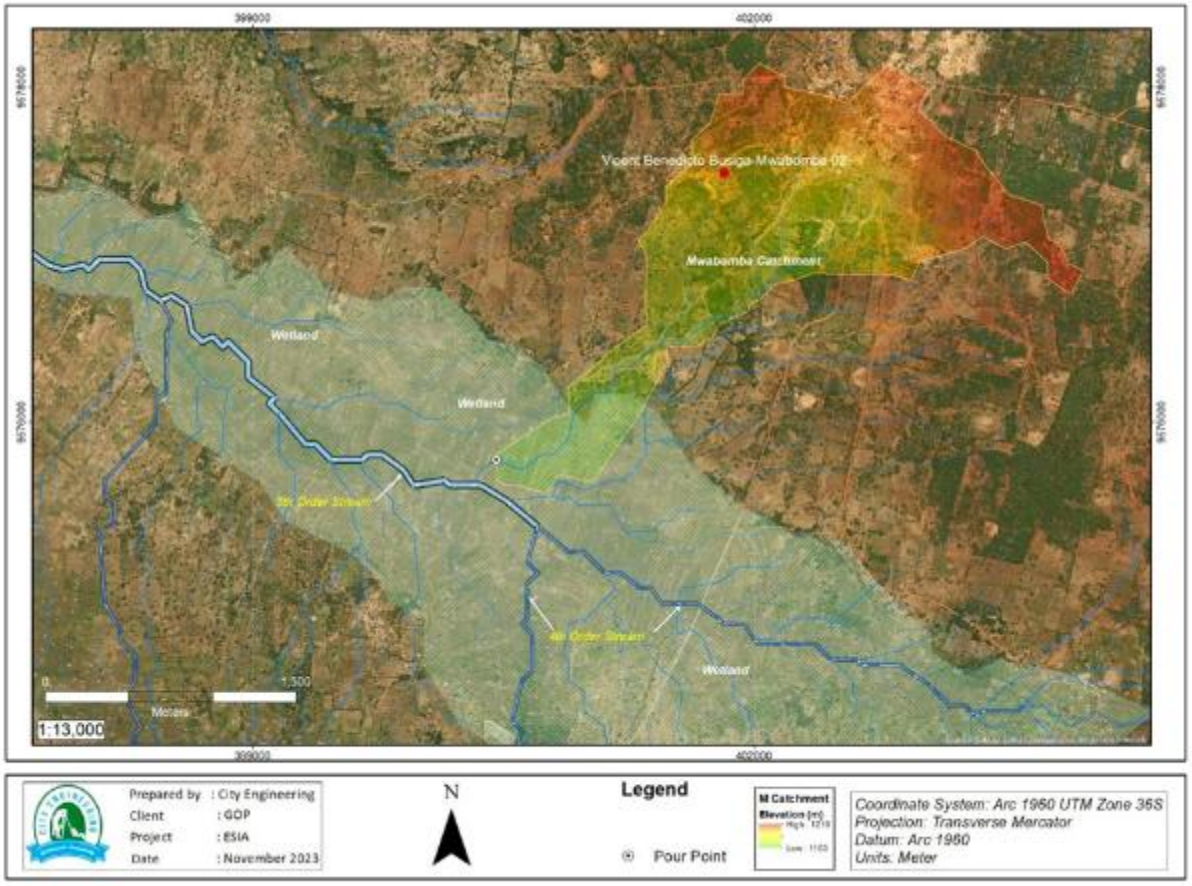


Figure 4-12: Study area watershed with discharge point at the downstream into wetland

Source (CECL)

4.6.2 Groundwater

During the site survey conducted in the study area, one groundwater source, Lyabukande dugwell as depicted on Figure 4-13 was identified. The identified groundwater source was a dugwell situated downstream the project area. This source is privately owned and to protect it the owner has built a house around it complete with roofing. The well serves as a sole water source for Mwabomba village that support a number of activities ranging from domestic use to mining use.

The dugwell is situated in close proximity to the riparian wetland (Figure 4-11), the well stands as a consistent and reliable source of water throughout the year. The strategic location of the well suggests a potential connection to the wetland, raising the likelihood that its water source may be attributed to the hydrological dynamics of the adjacent wetland area. The well's year-round water availability underscores its significance as a valuable resource, providing a sustained and dependable water supply for the whole village.

The well and the Riparian wetland serve as a vital water resource supporting various human activities, predominantly in agriculture. Cultivation practices in the vicinity include the growth of crops such as maize, beans, banana, okra, sweet potatoes, mangoes, avocado, and guava, demonstrating the essential role of the wetland in sustaining local livelihoods and welfare.

Figure 4-13: Lyabukande dugwell

Source (CECL)

4.6.3 Water Quality

Baseline water quality assessment was carried out within the proposed project area to determine the levels of heavy metals in surface and groundwater sources influenced by artisanal mining activities. Water samples were collected from two representative locations: the mine pit (Monitoring Point W1) and the Lyabukande dugwell downstream of the project area (Monitoring Point W2). Laboratory analyses focused on key heavy metals commonly associated with ASGM activities, including mercury (Hg), lead (Pb), arsenic (As), cadmium (Cd), copper (Cu), zinc (Zn), chromium (Cr), and selenium (Se).

Monitoring Locations

i. **Monitoring Point W1 – Mine Pit**: Located within the active mining pit, representing surface water directly influenced by mining operations. Coordinates: 3.1271° S, 29.7683° E.
ii. **Monitoring Point W2 – Lyabukande Dugwell**: Situated downstream near community settlement areas, receiving indirect influence from mining activities via runoff. Coordinates: 3.1280° S, 29.7715° E.

Results and Interpretation

The water quality results indicate that the **mine pit water (W1)** exhibits slightly elevated levels of mercury and lead, consistent with sediment runoff and mineralized soils exposed by mining operations. Other heavy metals analyzed, including arsenic, cadmium, copper, zinc, chromium, and selenium, were below the detection limits (<0.01 mg/L) or within guideline limits.

The **dugwell water (W2)** showed generally low concentrations of all analyzed metals, remaining well within Tanzanian and World Bank guideline limits. This suggests limited leaching of metals into groundwater and indicates that the dugwell continues to provide a reliable and safe water source for the local community.

These findings underscore the need for proper management of surface runoff and sediment control measures around the mine pit to prevent potential contamination of downstream water resources, while reassuring that current water quality at the dugwell remains suitable for domestic and community use.

- **Table 4-1: Heavy Metals in Surface and Groundwater at Mwabomba Site**

Parameter	Unit (mg/L)	Mine Pit (W1)	Dugwell (W2)	TZS 860:2019	World Bank EHSGs
Mercury (Hg)	mg/L	0.007	0.002	0.01	0.001
Lead (Pb)	mg/L	0.015	0.006	0.01	0.01
Arsenic (As)	mg/L	<0.01	<0.01	0.01	0.01
Cadmium (Cd)	mg/L	<0.01	<0.01	0.01	0.003
Copper (Cu)	mg/L	0.02	0.01	2	1.0
Zinc (Zn)	mg/L	0.05	0.03	3	5.0
Chromium (Cr)	mg/L	0.01	0.008	0.05	0.05
Selenium (Se)	mg/L	<0.01	<0.01	0.01	0.01

4.7 Air Quality

Air quality baseline conditions were established through systematic monitoring of key criteria pollutants at representative locations within and around a small-scale gold mining operation. Sampling was conducted to characterize the ambient air environment in an area influenced by artisanal mining activities, providing a benchmark against which future impacts can be assessed and potential occupational and community exposure risks evaluated.

Monitoring Point A1 – Near Mine Pit: Positioned adjacent to active mining and crushing operations to capture direct emissions. **Coordinates:** 3.1272° S, 29.7685° E

Monitoring Point A2 – Downwind Residential/Community Area: Located near areas where miners and community members may be exposed to dust and fumes carried from the mine. **Coordinates:** 3.1278° S, 29.7708° E.

Monitoring Point A3 – Peripheral/Mixed Use Area: Positioned slightly further from mining activity to monitor background air quality and general ambient levels. **Coordinates:** 3.1285° S, 29.7720° E

The monitored parameters included Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Ozone (O_3), Volatile Organic Compounds (VOC), Sulphur Dioxide (SO_2), and particulate matter (PM2.5 and PM10). These pollutants are of particular concern in small-scale mining contexts due to the use of diesel generators, artisanal equipment, and potential biomass burning for site clearance or domestic use.

Preliminary findings indicate generally low ambient pollutant concentrations, though particulate levels may show localized elevation near active crushing or haulage routes. The data confirm that current air quality remains within acceptable limits relative to the Tanzania Standard (TZS 845:2007) and World Bank EHS Guidelines, while providing a critical reference for monitoring any deterioration as mining activities scale up or intensify. The table below indicated the air quality analysis results.

Table 4-2: Air Quality Monitoring Results at the Mwabomba Site

Location	Coordinates	CO (ppm)	NO_2 (ppm)	O_3 (ppm)	VOC (ppm)	SO_2 (ppm)	PM2.5 (ppm)	PM10 (ppm)
Monitoring Point A1 – Near Mine Pit	3.1272° S, 29.7685° E	0.55	0.02	0.03	0.10	0.01	0.012	0.028
Monitoring Point A2 – Downwind Residential/Community	3.1278° S, 29.7708° E	0.50	0.02	0.03	0.09	0.01	0.010	0.020
Monitoring Point A3 – Peripheral/Mixed Use	3.1285° S, 29.7720° E	0.48	0.01	0.02	0.08	0.00	0.009	0.018
Tanzania Standard [TZS 845:2007]		20	0.1	0.1	10	0.05	0.05–0.08	0.05–0.116
World Bank EHSGs for Air Quality		10	0.2	0.1 (8hr)	NM	0.125	0.075	0.15

5 Alternatives Analysis

The aim of this project is to promote phasing out of mercury as the main extraction mechanism used by ASGM. The focus will be on promoting alternative technologies for gold extraction without the use of harmful chemicals. However, as viable technology that is accessible and can be easily adopted by ASGM is still being researched the project proposes improved handling and recovery to reduce exposure to ASGM and the environment.

5.1 No project Alternative

If nothing is done, the ASGM will continue to handle liquid mercury by bare hands; discharge the amalgamation pool overflow into the environment; open burning of the mercury amalgam without respiratory protection; and disposing ashes that may contain mercury on bare land. All these activities cause mercury pollution. Furthermore, the limited use of PPE will prolong the

exposure to respirable particulate matter, potential for injuries due to manual handling of rocks, tools and cargo that cause health and safety impacts largely to the employees but also to the children found onsite as their mothers had no one to care for them at home.

As this options supports continued health, safety and environment issues it is not a viable option.

5.2 VAT leaching Directly after Milling

The ASGM interviewed reported that VAT leaching was a preferred option as it has higher gold recovery rates and would shorten the processes needed to obtain gold. However due to the costs of constructing a VAT leach plant, permitting requirements and operational costs this was a solution that was out of reach as it required large volumes of ore to become economically viable which would take time to accumulate with the ASGM mining methods and they need fast cash to help them maintain the labour and daily operational requirements for the mine. Furthermore, VAT leaching plants are not located onsite and will require stockpiles to be transported to the plant offsite and another set of workers which had the necessary skills to safely and efficiently operate leaching plant. Mercury is easily available within proximity to the site and not costly e.g. said to cost TSh 50,000/- per bob (measured in a cap of soda or beer) and one would need about 2 to 3 whereas accessing a VAT plant is at minimum TSh. 5 Million.

Impacts associated with this option include high investment and operation costs, use of hazardous chemicals (cyanide and lime), generation of chemical wastes from packaging and remnant tailings, and skilled labour force. However, it will eliminate the need for mercury and associated amalgamation process and burning. This option was found to be viable downstream of the mercury amalgamation process which will is needed to generate the necessary cash for ASGM to access the VAT leaching plants. However, reprocessing mercury contaminated tailings results in mercury/cyanide compounds that are more easily dispersed in waters and make mercury more bio-available. The ASGM at all sites admitted that they were reprocessing tailings from the amalgamation pool.

5.3 Direct Smelting

In this process, A small mass of high-grade concentrate is first produced (by milling, sluicing and/or concentrating), then it is melted to separate the gold from other minerals. If working with sluice carpet concentrate, additional concentration beyond the stage at which mercury is applied is required before direct smelting can be applied. Direct smelting is an alternative processing pathway that does not use mercury. However it is important to understand that it is not a direct replacement for mercury because it is not applied at the same stage of processing. Mercury is commonly applied to large masses of concentrate - for example, 20 kg coming from the carpets of a sluice - whereas direct smelting is performed on small masses of high grade concentrate usually no larger than 100g[4]. The challenge in this method is in the production of high-grade concentration (More than 25%), which may be achieved by using a number of sluices or various methods of gravity concentration e.g. panning or mechanical separators are used e.g. shaking table.. As no mercury is used, this method is more environmentally friendly, however as it requires multiple efforts to produce the high grade concentrate and by the common methods available of sluicing and panning is tedious, may

[4] AGC_Practical-Guide-on-Reducing-Mercury-in-ASGM_en.pdf (artisanalgold.org)

cause gold losses in additional concentration steps and is time and energy consuming. These factors make it less appealing to the ASGM and hence it was not considered further.

5.4 Use of retorts

Heating to vaporize off mercury from the Gold mercury amalgam obtained from panning (reported to contain 40 – 60% Mercury[5]) is another way workers and their families are exposed to mercury which subsequently reaches the environment. In order to remove this pathway use of retorts have been prescribed in the Mining (Environmental Protection for Small Scale Miners) Regulations of 2010 in separating gold from the amalgam. Retorts heat amalgam in one part and cool and condense the mercury vapor back into a liquid in another part of the device which can then be re-used after activation. Care should be taken when handling retorts as they are contaminated with mercury and one should wait until they have completely cooled not to cause secondary mercury vapors release. Retorts are not commonly used in Artisanal and Small-Scale Gold Mining (ASGM) due to several reasons. One of the main reasons is that retorts require a certain level of technical expertise to operate and maintain, which may not be available to many ASGM miners. Additionally, retorts can be expensive to purchase and may not be affordable for many ASGM miners[6]. The impacts associated with the use of retorts are that they can provide a source of secondary pollution when disposed. However the benefits of capturing mercury which can be reused (resource recovery) is favourable than the risks of secondary pollution which can only occur when the retort and associated components are not properly handled. This project proposes the use of retorts in separation of gold/mercury amalgam.

[5] (PDF) Situational Analysis of Gold Processing Practices at Artisanal and Small-Scale Gold Mining in Tanzania (researchgate.net)
[6] Guide.pdf (unep.org)

6 Environmental and Social Risks and Impacts

The Environmental and Social (E&S) and screening processes was followed by the project during the site selection process. The key potential environmental and social issues remaining after the comprehensive site screening process are related to:

- hazardous waste management (including disposal) at pilot sites;
- dust and particulate materials, causing nuisances to surrounding families and businesses, specially to sensitive receptors (children, elders) during construction;
- undesirable noise levels due to the machinery and equipment especially in areas with health centers, homes for the elderly and schools;
- occupational health and safety of workers; and
- terms and conditions of employment of workers.

These were observed at the operational processing facilities available at all the sites as the model plant will have similar facilities as narrated in Section **Error! Reference source not found.**. the main envisaged impacts are due to releases to air, land, water and impacts to people involved in mining/processing and other land users

6.1 Identified Impacts

The Impacts Identified at the construction and operations phases are included in Table 6-2 and Table 6-3. These corelate to the risks identified in the ESCP. However as similar activities are undertaken within the vicinity of the project sites the risk level determination based on the prevailing environmental conditions and hence for most the impacts are low.

6.1.1 Generation of Undesirable Levels of Noise

The operation of the crusher and generators powering the crushers and dewatering pumps significantly contribute to the levels of noise. As observed when noise measurements were undertaken at Mwaboma N14, the baseline noise levels are already above the limit for areas with mixed residential, commercial and production activities. However, as this is a gold rush area, these levels are not considered a nuisance to the residents, and they are actually pleased that activities are ongoing providing them with a source of livelihood and income. The impact due to noise from operation of the plant is high as the probability if almost certain, magnitude high and consequences of hearing impairment are permanent.

6.1.2 Employee Health, Safety and Welfare

There are a number of HSE risks associated posed to the project employees

Site risks – potential for injuries due to falling into the abandoned mine pits, sluicing drainage and abandoned toilet pits;

Inherent risks associated with construction activities of potential for injuries due to working at height, manual handling; contact with sharp, heavy and moving objects; slip and trip due to uneven ground and various items placed onsite, dust and noxious gases emissions; increased levels of noise; using shared sanitary facilities; sexual interactions amongst workers and the community;

Inherent risks associated with ore processing including noise, dust, contact with hazardous extraction chemicals (mercury, cyanide, lime)

Welfare risks which include unfair employment conditions including payment below minimum wage, excessive working hours, discrimination and harassment

6.1.3 Community Health and Safety Risks

Increased potential for accidents due to increased traffic for transit of goods and project personnel; or community members especially children accessing the construction site and the gold ore processing facility during operation

Increased levels of noise, dust and chemicals emissions/discharge which may impact community health.

Project employees interacting with community member and transmitting STIs and upon project closure abandon families increasing the number of vulnerable groups (single/women and child headed families)

6.1.4 Impacts to Water Resources

Increased water demand for use in construction, by construction workers and operation of the proposed gold ores processing facility

Both domestic and operations wastewater have a potential to contaminate water sources from inadequate control of storm water at the site and discharge of waste water

6.1.5 Generation of Hazardous Waste

Construction wastes will contain cement, paints and specific materials which contain hazards

The use of extraction chemicals e.g. Mercury, Cyanide and Lime will generate chemical contaminated waste from packaging/containers, tailings and wastewater.

6.2 Impact Assessment Criteria

The criteria adopted mimicked the recommendations of ESCP Annex II: World Bank ESF Risk Categories which defined a level of risk according to a combination of duration, extent, probability of occurrence and magnitude. To determine the different levels the consultant adopted methodology that was utilized before that aligns with the Australian and New Zealand impact assessment criteria as included in Table 6-1.

Table 6-1: Risk Assessment Criteria

Criteria	Category	Description
Nature	Positive	Beneficial environmental change
	Negative	Adverse environmental change
Extent of impact: spatial limit of the impact	International	Beyond Tanzania's borders
	National	Tanzania
	Regional	Beyond the regional boundaries or watershed
	Local	Within district within Ward/village borders, or at off-site locations (material sources, waste disposal sites, etc.)
	Site-specific	Onsite or within the 100m

Criteria	Category	Description
Magnitude of impact	High	Natural functions and processes/existing conditions are severely altered. Sensitive/protected species or habitats are severely affected
	Medium	Natural functions and processes/existing conditions are notably altered. Sensitive/protected species or habitats affected
	Low	Natural functions and processes/existing conditions are slightly altered. Sensitive/protected species or habitats not affected
	Very low	Natural functions and processes/existing conditions are negligibly altered
	Zero	Natural functions and processes remain unaltered
Duration of impact	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases. For instance, one month.
	Medium term	The impact will last up to the end of the phases, whereafter it will be negated. For instance, for several months.
	Long term	The impacts last a couple of years or will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.
	Residual/ Enduring term	Impact lasts several years to and past life of operations. Will last past the post-closure phase of the project (after cessation of the activity) but will be mitigated by direct human action or by natural processes thereafter.
	Permanent	Permanent impact. The impact will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.
Probability: impact occurrence likelihood	Improbable	The possibility of the impact occurring is very unlikely
	Probable	There is a good possibility (<50% chance) that the impact will occur
	Highly probable	It is most likely (50-90% chance) that the impact will occur
	Definite	The impact will occur regardless of any preventive measures (>90% chance of occurring)

Table 6-2: Construction Phase Impacts Identified and Their Corresponding Risk Level

Phase/Activity	Potential Impact	Probability	Magnitude	Duration	Extent	Risk Level
Construction Phase						
Construction of sluices, VAT leaching tanks, drainage and amalgamation pool	Generation of dust from cement works	Probable	Low	Medium term	Site specific	Low
	Potential for accidents due to falling in foundation and sluice drainage/sediment trap excavations and from working at height	Probable	Low	Medium term	Site specific	Low
	Potential for accidents due to falling objects	Probable	Low	Medium term	Site specific	Low
	Health and safety risks due to manual heavy lifting	Probable	Low	Medium term	Site specific	Low
	Generation of construction wastes (cement bags/mixed cement/concrete	Probable	Low	Medium term	Site specific	Low
		Probable	Low	Medium term	Site specific	Low
Rehabilitation of degraded land, landscaping and tree planting	Improved health and safety due to backfilling of mining pits and excavations and levelling the ground	Probable	Low	Medium term	Site specific	Low
	Exposure of loose soil that my that may wash into waterways and cause siltation	Probable	Low	Medium term	Site specific	Low
	Change in drainage patters	Probable	Low	Medium term	Site specific	Low
	Improved biodiversity due to encouraging and planting vegetation	Probable	Low	Medium term	Site specific	Low
	Improved aesthetics	Probable	Low	Medium term	Site specific	Low

Phase/Activity	Potential Impact	Probability	Magnitude	Duration	Extent	Risk Level
Transit of supplies and project personnel to and from site	Increased traffic that increases potential for accidents in the community especially for children	Probable	Low	Medium term	Site specific	Low
Provision of food to employees	Generation of food waste	Probable	Low	Medium term	Site specific	Low
Provision of drinking water	Potential for communicable diseased due to use of unsafe water supply	Probable	Low	Medium term	Site specific	Low
	Increased water demand	Probable	Low	Medium term	Site specific	Low
Employee hygiene	Potential for spread of communicable diseases due to use of unsanitary washrooms	Probable	Low	Medium term	Site specific	Low
Sourcing of labour	Immigration of construction workers	Probable	Low	Medium term	Site specific	Low
	Unfair employment terms to local people	Probable	Low	Medium term	Site specific	Low
	Unfair employment terms to Women	Probable	Low	Medium term	Site specific	Low
	Potential for child labour	Probable	Low	Medium term	Site specific	Low
Demobilization of construction workers	Increase number of single women and child headed families due to abandoning families	Probable	Low	Medium term	Site specific	Low

Table 6-3: Operations Phase Impacts Identified and Their Corresponding Risk Level

Activity	Potential Impact	Likelihood	Magnitude	Duration	Extent	Risk Level
Drying of ore	Health and safety risks due to manual heavy lifting	Probable	Low	Medium term	Site specific	Low

Activity	Potential Impact	Likelihood	Magnitude	Duration	Extent	Risk Level
	Generation of sediments that may wash into waterways	Probable	Low	Medium term	Site specific	Low
Crushing of ore using hand hammers	Generation of undesirable level of noise	Definite	Medium	Long term	Local	Moderate
	Generation of dust exposure to workers	Probable	Low	Medium term	Site specific	Low
	Increased potential for finger injuries due to use of hand hammers	Probable	Medium	Medium term	Site specific	Low
	Exposure of children to mine hazards due to being at the minesite with mothers for care	Probable	Medium	Long term	Local	Moderate
Grinding/milling using crushers	Generation of undesirable level of noise	Probable	Low	Medium term	Site specific	Low
	Generation of dust	Probable	Low	Medium term	Site specific	Low
	Generation of metal waste (steel balls and work crushers)	Probable	Low	Medium term	Site specific	Low
Supplying of power to the crushers	Generation of noise from the onsite generators	Probable	Low	Medium term	Site specific	Low
	Emission of noxious gases from generators	Probable	Low	Medium term	Site specific	Low
	Increased potential for hydrocarbon spills polluting land and water	Probable	Low	Medium term	Site specific	Low
	Potential for fire from power generators	Probable	Low	Medium term	Site specific	Low
Sluicing	Potential for inhalation of dust during handling of milled ore	Probable	Low	Medium term	Site specific	Low
	Increased water demand for sluicing	Probable	Low	Medium term	Site specific	Low
	Generation of sediment loaded waste water	Probable	Low	Medium term	Site specific	Low

Activity	Potential Impact	Likelihood	Magnitude	Duration	Extent	Risk Level
	Generation of tailings	Probable	Low	Medium term	Site specific	Low
Amalgamation	Exposure of employees elemental mercury by contact	Probable	Medium	Long term	Local	Moderate
	Generation of waste water that contain mercury in the amalgam pool	Probable	Medium	Long term	Local	Moderate
	Generation of mercury laden tailings	Probable	Medium	Long term	Local	Moderate
	Generation of gold that contains mercury as impurity	Probable	Medium	Long term	Local	Moderate
	Promoting continued mercury production and trade	Probable	Medium	Long term	Local	Moderate
Removal of mercury and impurities in gold amalgam via heating	Increased demand for charcoal and firewood	Probable	Low	Medium term	Site specific	Low
	Release of mercury in air causing pollution	Highly Probable	Medium	Long term	Regional	High
	Exposure of employees to mercury aerosols	Highly Probable	Medium	Long term	Regional	High
	Generation of ashes that may contain mercury	Probable	Low	Medium term	Site specific	Low
	Generation of mercury contaminated waste from utilizing retort	Probable	Low	Medium term	Site specific	Low
VAT Leaching of tailings	Exposure of employees to hazardous chemicals (Cyanide and Lime)	Probable	Low	Medium term	Site specific	Low
	Generation of mercury and other leaching byproducts laden tailings	Probable	Low	Medium term	Site specific	Low
	Increased water demand	Probable	Low	Medium term	Site specific	Low

Activity	Potential Impact	Likelihood	Magnitude	Duration	Extent	Risk Level
	Exposure of employees to drowning in the VAT tanks	Probable	Low	Medium term	Site specific	Low
	Generation of chemical wastes from packaging	Probable	Low	Medium term	Site specific	Low
	Requirement of skilled labour	Probable	Low	Medium term	Site specific	Low
Provision of food to employees	Generation of food waste	Probable	Low	Medium term	Site specific	Low
	Consuming contaminated food (Mercury/dust) as most eat at their worksite	Probable	Low	Medium term	Site specific	Low
Provision of drinking water	Potential for communicable diseased due to use of unsafe water supply	Probable	Low	Medium term	Site specific	Low
	Increased water demand	Probable	Low	Medium term	Site specific	Low
Employee hygiene	Potential for spread of communicable diseases due to use of unsanitary washrooms	Probable	Low	Medium term	Site specific	Low
Provision of labour	Unfair employment terms to local people	Probable	Low	Medium term	Site specific	Low
	Unfair employment terms to Women	Probable	Low	Medium term	Site specific	Low

7 Environmental and Social Mitigation Measures

Most of the impacts identified can be mitigated to a large extent by measures which have been previously developed, tested and approved and in cases incorporated in legislation and best practice guidelines. They require changes in behaviour and willingness to adopt to new ways of operating.

7.1 Measures for Impacts During Construction

Several impacts were identified for the construction period a majority which are pertaining to health and safety of both project employees and community. Corresponding mitigation measures proposed during the construction period are included in Table 7-1.

Table 7-1: Mitigation Measures for the Construction Phase Identified Impacts

Phase/Activity	Potential Impact	Proposed Mitigation
Construction of sluices, VAT leaching tanks, drainage and amalgamation pool	Generation of dust from cement works	• Ensure construction workers receive training prior to commencing work • Provide PPE and enforce usage • Engage HSE Officer as part of construction crew • Promote good cement handling and limit wasteful pracices
	Potential for accidents due to falling in foundation and sluice drainage/sediment trap excavations and from working at height	• Demarcate all areas with falling hazards • Provide scaffolding for persons working at height • PPE and enforce usage • Ensure Job Safety Hazard analysis is conducted prior to commencing work and required mitigation measures are in place
	Potential for accidents due to falling objects	• Ensure safety signs are placed at strategic areas to provide warning • Provide PPE and enforce usage • Provide tool holding equipment for persons working at height
	Health and safety risks due to manual heavy lifting	• Provide manual handling and lifting training. • Use mechanical lifting and transporting equipment/ devices e.g. pulley,
	Generation of construction wastes (cement bags/mixed cement/concrete	• Institute a waste management program that promotes waste segregation • Have a recyclable waste storage facility that is secured • Identify permitted contractors/person who can collect and recycle the wastes • Avoid wasteful practices

Phase/Activity	Potential Impact	Proposed Mitigation
		• Use hardened cement and concrete debris as core
Rehabilitation of degraded land, landscaping and tree planting	Improved health and safety due to backfilling of mining pits and excavations and levelling the ground	• Landscape the area to promote aesthetic appeal • Plant trees and vegetation that is common to the floristic region • Use drought resistance and low maintenance vegetation
	Exposure of loose soil that my that may wash into waterways and cause siltation	• Landscape to ensure non scouring/erosion promoting slopes • The landscaping should ensure minima areas are left bare • Include sedimentation basins in drainage
	Change in drainage patters	• Landscape according to the natural topography ensuring free draining • Include water crossings for areas with defined drainage channels
	Improved biodiversity due to encouraging and planting vegetation	• Landscape the area to promote aesthetic appeal • Plant trees and vegetation that is common to the floristic region • Use drought resistance and low maintenance vegetation that can thrive without need for care
	Improved aesthetics	• Landscape the area to promote aesthetic appeal • Plant trees and vegetation that is common to the floristic region • Use drought resistance and low maintenance vegetation that can thrive without need for care
Transit of supplies and project personnel to and from site	Increased traffic that increases potential for accidents in the community especially for children	• Ensure traffic management rules are in place and communicated to employees • Provide awareness to the community members • Ensure operators are trained and certified according to the national driving requirements and in addition the project specific drivers training • Liaise with TARURA and install safety signs on community roads
Use of heavy equipment	Potential for hydrocarbon spills	• Contractor will be required to use appropriate fuelling equipment with spill prevention measures when refuelling onsite • Use of plastic drums and mats under heavy

Phase/Activity	Potential Impact	Proposed Mitigation
Provision of food to employees	Generation of food waste	• Engage local food vendors who will prepare food offsite and bring food in reusable utensils and containers • Properly segregate food waste to ensure no harmful objects are contained and identify recycling opportunities • Consider having a composting unit • Ensure eating area is kept clean and dust bin sealed to discourage vermin infestation
Provision of drinking water	Potential for communicable diseased due to use of unsafe water supply	Ensure access to adequate amounts of potable water
	Generation of light plastics waste (water bottles)	• Ensure recyclable plastics collection point is available • Engage plastic waste collectors who are operating in Kahama town and idenfity economical means to promote recyclable waste collection
	Increased water demand in community water supply	Consider provision of bottled water or bulk water supply
Employee hygiene	Potential for spread of communicable diseases due to use of unsanitary washrooms	• Provide adequate facilities for sanitary convenience e.g. mobile toilets and mobile septic tanks • Engage cleaner to ensure that they are kept in hygienic conditions • Frequently empty full sewage tanks utilizing permitted contractors •
Sourcing of labour	Immigration of construction workers	• Adopt principles included in Labour Management Plan where unskilled workers will be local hired through the village authority • No migrant labour will be employed by the project • Specialized work will be undertaken by contractors who will be responsible for managing their employees
	Unfair employment terms to local people	• Include adherence to labour requirements in contracts for engaged contractors • Ensure that employees are provided with contracts as per Employment and Labour relations act 2004 • Ensure labour rights and responsibilities specific training is provided to both contractor and

Phase/Activity	Potential Impact	Proposed Mitigation
		employee the district authority responsible for labour • Ensure the project and contractor has a grievance mechanism and that employees are aware of it
	Unfair employment terms to Women	• Include adherence to labour requirements in contracts for engaged contractors
	Potential for child labour	• Include adherence to labour requirements in contracts for engaged contractors
Demobilization of construction workers	Increase number of single women and child headed families due to abandoning families	• Provide awareness to project employees and community pertaining to interactions • Ensure the project and contractor has a grievance mechanism and that employees are aware of it • Engage local NGOs who work on these matters to assist

7.2 Measures for Impacts During Operations

The main impacts associated with the operations phase are related to the use of chemicals specifically Mercury. Reductions in mercury use are more likely to be accepted by miners and become permanent if they increase or at least maintain income. These may be achieved by:

- Conserving or eliminating the need for mercury and other reagents, saving costs
- Saving time by more efficient processing
- Recovering more gold by improving extraction techniques, which might include using better technology or using existing technology better
- Getting a better price for gold by following standards that get a better market price (incentives)[7]

Furthermore, changes in the way people work e.g. utilizing mechanical rather than labour means e.g. rock breaking and utilizing PPE can be adopted if they can understand the benefits and lower their risk tolerance levels. Others need supporting environment, e.g. availability of caregivers for children at home or another designated area such that their mothers can comfortably leave them and come to work limiting small children exposure to hazardous environment at the mine. The mitigation measures should also be inclusive not leaving behind a group of people without livelihoods e.g. adoption of mechanical rock crushing will leave the women engaging in this activity (Wapiga Ukwara) jobless and they are no longer able to support their families.

Table 7-2:Mitigation Measures for Operation Impacts

[7] AGC_Practical-Guide-on-Reducing-Mercury-in-ASGM_en.pdf (artisanalgold.org)

Activity	Potential Impact	Proposed Mitigation
Drying of ore	Health and safety risks due to manual heavy lifting	• Provide manual handling and lifting training. • Use mechanical lifting and transporting equipment/ devices e.g. pulley,
	Generation of sediments that may wash into waterways	Construct drainage around the site and sediment trap prior to discharge
Crushing of ore using hand hammers	Generation of undesirable level of noise the neighbours at the adjacent guest house and shops/bars	• Conduct activities during daytime hours • Provide hearing protection to employees
	Generation of dust exposure to workers	• Ensure workers receive training prior to commencing work • Provide PPE and enforce usage • Engage HSE Officer as part of construction crew • Install mechanical crusher plants • Apply water as dust suppressant in mechanical crushers
	Increased potential for finger injuries due to use of hand hammers	• Provide PPE and enforce usage • Ensure job hazards analysis is conducted and mitigation measures are in place • Install mechanical crusher plants
	Exposure of children to mine hazards due to being at the minesite with mothers for care	Liase with NGOs and community on support system for child care while mother is working
Grinding/milling using crushers	Generation of undesirable level of noise	• Conduct activities during daytime hours • Provide hearing protection to employees
	Generation of dust	• Conduct activities during daytime hours • Provide respiratory protection to employees
	Potential for injuries due to being exposed to moving parts of the crusher	• Provide mechanical guards • Isolate the crushers to limit access of
	Generation of metal waste (steel balls and work crushers)	Engage recyclable waste contractors

Activity	Potential Impact	Proposed Mitigation
Supplying of power to the crushers	Generation of noise from the onsite generators	• Improve availability of national grid power • Conduct activities during daytime hours • Provide hearing protection to employees
	Emission of noxious gases from generators	• Improve availability of national grid power • Service generators as per manufacturer's recommendations
	Increased potential for hydrocarbon spills polluting land and water	• Generators should be placed in enclosures with their covers in place • Service generators as per manufacturer's recommendations
	Potential for fire from power generators	• Service generators as per manufacturer's recommendations • Install fire extinguishers within proximity of generators
Sluicing	Potential for inhalation of dust during handling of milled ore	Provision of PPE to workers
	Increased water demand for sluicing	• Continue practice of removing sediments and reusing excess water
	Generation of sediment loaded waste water	• Install sediment traps at discharge sites
	Increasing potential for sedimentation in water resources due to improper storage of generated tailings	• Improve facilities for tailings storage to have cut off drainage that isolates the tailings from rounof
	Potential for slip and fall and drowning from the sluicing plant drainage and sediment traps	• Provide covers for the drainage system • Barricade the drainage to limit exposure
Amalgamation	Exposure of employees elemental mercury by contact	• Provide hand and respiratory PPE •
	Generation of waste water that contain mercury in the amalgam pool	• Provide training on how to improve panning process to increase mercury recovery • Reuse water in the amalgamation pool in panning
	Generation of mercury laden tailings	• Improve facilities for tailings storage to have cut off drainage that isolates the tailings from rounof

Activity	Potential Impact	Proposed Mitigation
	Generation of gold that contains mercury as impurity	• Use retort in removal of excess mercury from amalgam to promote recapture and reuse
	Promoting continued mercury production and trade	• Investigate on increasing efficiency, availability and cost effectiveness of non mercury processes • Investigate on mechanisms that can provide subsidy to VAT chemicals so they can be more affordable to ASGM • Encourage banks to provide finance ASGM eliminating the need for quick cash to finance mining operations and VAT extraction that leads to requiring fast cost effective leaching using mercury
Removal of mercury and impurities in gold amalgam via heating	Increased demand for charcoal and firewood	• Use alternative energy sources e.g. LPG and acetylene blow torch
	Release of mercury in air causing pollution	• In cooperation with ASGM investigate on how to promote the use of retorts and/or fumehoods. • Enforce regulations mandating the use of retort
	Exposure of employees to mercury aerosols	• In cooperation with ASGM investigate on how to promote the use of retorts and/or fumehoods. • Enforce regulations mandating the use of retort
	Generation of ashes that may contain mercury	Improve facilities for ashes storage to have cut off drainage that isolates the ashes from rounof
	Generation of mercury contaminated waste from utilizing retort	ASGM should have facilities for storage of mercury contaminated waste. E.g. use steel drums used to supply metal balls for the mills
VAT Leaching of tailings	Exposure of employees to hazardous chemicals (Cyanide and Lime)	• Ensure workers receive training prior to commencing work • Provide PPE and enforce usage • Have a chemical handler trained and certified by GCLA

Activity	Potential Impact	Proposed Mitigation
	Generation of mercury and other leaching by products laden tailings	Remove mercury from tailings obtained from amalgamation pool prior to VAT leaching
	Increased water demand	Improve water recovery and management to reduce the need for fresh water
	Exposure of employees to drowning in the VAT tanks	Provide barricade and warning signs at leach tanks
	Generation of chemical wastes from packaging	MC/NEMC/GCLA to provide affordable access to chemical waste dealers to ASGM
	Requirement of skilled labour	GCLA in collaboration with MC to provide training to ASGM Require ASGM have formally trained employee in their structure
Provision of food to employees	Generation of food waste	• Discourage food consumption at site • Provide employees with lomch break so they can go and eat elsewhere
	Consuming contaminated food (Mercury/dust) as most eat at their worksite	• Discourage food consumption at site • Provide employees with lomch break so they can go and eat elsewhere
Provision of drinking water	Potential for communicable diseased due to use of unsafe water supply	Ensure access to adequate amounts of potable water
	Generation of light plastics waste (water bottles)	• Ensure recyclable plastics collection point is available • Engage plastic waste collectors who are operating in Kahama town and idenfity economical means to promote recyclable waste collection
	Increased water demand in community water supply	Consider provision of bottled water or bulk water supply
Employee hygiene	Potential for spread of communicable diseases due to use of unsanitary washrooms	• Provide adequate facilities for sanitary convenience • Engage cleaner to ensure that they are kept in hygienic conditions • Frequently empty full sewage tanks utilizing permitted contractors •

Activity	Potential Impact	Proposed Mitigation
Sourcing of labour	Immigration of construction workers	• Operational staff to be provided by the cooperative managing the PML
	Unfair employment terms to local people	• Include adherence to labour requirements in agreement with the cooperative • Ensure that employees are provided with contracts as per Employment and Labour relations act 2004 • Ensure labour rights and responsibilities specific training is provided to both cooperatives managers and employee the district authority responsible for labour • Ensure the project and contractor has a grievance mechanism and that employees are aware of it
	Unfair employment terms to Women	• Include adherence to labour requirements in contracts for engaged contractors
	Potential for child labour	• Include adherence to labour requirements in contracts for engaged contractors

7.3 Management of Employee Health and Safety

There are number of risks that have been identified which impact on employee health and safety for both the construction and operations phase. A number of measures for the construction phase have been recommended including employee training, provision of PPE, undertaking Job hazard analysis and employment of HSE Officer. These should form the basis for of the Contractors Health and Safety Management Plan that is to be developed for the project. However, the main challenges are in the operations phase which will be managed by the Site owners.

7.3.1 Use of Mechanical Crushers

Installation of mechanical crusher is an engineering solution that will protect the workers especially the women from ergonometric; hand and finger injuries from hammering; and being continuously facing dust that may not only cause respiratory but also eye injuries. However, there is a risk that with mechanization some of the employees may loose their jobs and as already stated these are mainly widowed or abandoned women who are heading their families. Hence additional measures to cater for preserving livelihoods is recommended that includes the women having rosters to ensure they all work in shift and those off shift will be responsible for taking care the children in the group. These roles should be rotated on a daily basis. Feasibility of this proposal should be discussed in the feedback session.

7.3.2 Training and Enforce Sustained and Appropriate Use of PPE

The Mining legislation has areas that mandate use of PPE and also there is an MRO onsite and the appointed Mine Manager and HSE Officers are responsible for ensuring requirements are met. These should be enforced on a daily basis and penalties for non compliance e.g. removal from work for some time which will cause the person to loose income could be considered. Prior to initiating penalties the employees should be trained and provided with PPE. The MRO should lead this and Mining Commission should liaise with OSHA and ensure employee induction and refresher training is available and easily accessible. Both Mining Commission and OSHA should set aside funds for these trainings such that miners and PML costs are kept low and affordable. There should be certification systems and any employee without a valid certificate should not be allowed to work.

7.4 Liase with NGOs, LGA and community on provision of support system for child care while mothers are working

Small children were found onsite while their mothers were working due to having no caregiver at home. As already narrated in section 1.2, mercury is specifically toxic to fetuses and young children. The LGA, local daycare centres, schools, the Cooperatives managing the site and Ukwara Women themselves should designate an area offsite that will serve as a daycare centre and provide funds to finance the caregivers, children daily needs and early education. This should be discussed inline with the proposal to mitigate loss of employment due to installation of mechanical crushers in section 7.3.1.

7.5 Enforcing the Use of Retort in separating Mercury from the Gold Amalgam

Use of retorts have been prescribed in the Mining (Environmental Protection for Small Scale Miners) Regulations of 2010 in separating gold from the amalgam. Retorts are not commonly used by ASGM due to several reasons. One of the main reasons is that retorts require a certain level of technical expertise to operate and maintain, which may not be available to many ASGM miners. Additionally, retorts can be expensive to purchase and may not be affordable

for many ASGM miners[8]. The Mine Commission, PIT, SIDO and the Cooperatives owning and operating the mines should agree on a simple and cost effective retort design that is to be installed at the demonstration site and its use enforced by the Mine Resident Officer, Mine Manager and HSE Officer.

7.6 Ensure traffic management rules are in place and communicated

Increased traffic especially during construction on the community roads may lead to accidents. It is recommended that a traffic management plan in accordance to ESS 4 is developed and communicated to project employees and the community.

7.7 Include adherence to labour requirements in contracts for engaged contractors

Risks of unfair employment terms including pay below minimum wage, discrimination and child labour due to the area having a vulnerable population including the poor, female headed households and child headed households there is a risk that the contractor engaged to build the plant and the cooperative who will run the plant to provide unfair terms to their employees. To mitigate this risk, the ESMP will include specific requirements to ensure that employment conditions are fair and a commensurate wage is provided.

[8] Guide.pdf (unep.org)

8 Public Consultation and Information Disclosure

Public consultation and project information disclosure for this project occurred in two phases: during the preparatory works when undertaken by the PIT and during this ESIA undertaken by the consultant. The stakeholders engagement plan followed by the ESIA team followed the principles outlined in the project Stakeholder Engagement Plan (SEP).

- Stakeholders identification and analysis included the list of stakeholders included in Annex I of the SEP
- To enhance that engagement is free, prior and informed the team notified the identified stakeholders mainly via telephone and explained the agenda at least a week before the engagement date. Due to the schedule it was difficult to send Official letters, notices, and electronic mail.
- Different consultation methodologies employed for different stakeholder utilizing simple language
- The project team followed the stakeholders to their places of work, minesites, village/ward offices areas which they have access to

8.1 Objectives of Stakeholder Consultation in ESIA

The stakeholder's consultation and engagement process aims to achieve the following overarching objectives as part of the ESIA process:

- To prepare the environmental and Social Management Plan and through recommendation appropriate environmental and social preventive, mitigation, and monitoring intervention
- To ensure that stakeholders are well informed about the proposed Project;
- To provide stakeholders the sufficient opportunity to engage and provide input and suggestions on the proposed Project;
- To verify that stakeholder comments have been considered and addressed;
- To draw on local knowledge in the process of identifying environmental and social concerns associated with the proposed Project, and to involve stakeholders in identifying ways in which these can be addressed;
- To comply with the local legislative requirements; and
- To incorporate international good practice.

8.2 Stakeholder Identification and Analysis

Identification of stakeholders considered those people and institutions that have an interest in the design, implementation, and sustainability of the Project. This includes those positively and negatively affected by the Project. An approach for systematically identifying stakeholder groups was guided by the following:

- Dependency- groups or individuals or on whom the Project proponent will depend in one way or another in order to operate, e.g. the cooperatives managing these sites
- Responsibility-groups or individuals to whom the Project proponent has, or in the future may have, legal, commercial, operational or ethical/moral responsibilities, e.g. the women crushing the rocks.

- Tension-groups or individual who will need immediate attention from the proponent with regard to social or environmental issues associated with the Project, individuals who may oppose the project, e.g. NGOs;
- Influence-groups and individuals who can have impact on the Project with regard to strategic planning or operational decision making, e.g. LGAs, regulators of various aspects; and
- Diverse perspectives- groups and individual whose different views can lead to a new understanding of the situation and the identification of opportunities for action that may not otherwise occur.

The stakeholder analysis was used to group stakeholders according to their influence and support in relation to the Project. Table 8-1 below provides the list of stakeholders for the construction of ores Goild washing facilities that were identified in the stakeholder engagement process.

Table 8-1: List of Project Stakeholders and their roles

Stakeholders Group	Stakeholders	Relevance to the Project
Regulators/Government Agencies/Institutions	Government Chemist Laboratory Agency (GCLA), Mwanza,Lake Tanganyika Basin Water Office, Inland Drainage Basin Water Office, Fire and Rescue Services	The Authority deals with permits related to chemicals handling, management and usage; water resources management and pollution prevention; emergency services
Regional Administration	Shinyanga and Singida Regional Management Team Regional Commissioner Regional Administrative Secretary - RAS Regional Medical Officer-RMO Regional Mine Officer -RMO (mines) Regional Fire Officer-RFO Regional Police Commander -RPC TFS	In charge of regional community health and welfare, investment development, environment management and security.
District Administration	For Shinyanga Region (Kahama Municipal) and Singida Region(Ikungi and Iramba Districts) DED -District Executive Director District Management Team District Commissioner	Responsible for people's welfare in the District and responsible for District development. They oversee the general community's welfare (in terms of People's rights, environment, security, welfare etc).

Stakeholders Group	Stakeholders	Relevance to the Project
	District Administrative Secretary Heads of Department -DCDO, DEMO, Social welfare, Planning, DMO	
Ward Administration	For Kahama district (Idaihana and Zongomela Ward) and Singida district (Nkonkilangi and Mangonyi wards) Ward Councillor Ward Development Committee Ward Executive Officers Ward Development committee	Responsible for Ward administration, community development, social welfare, environment and land management.
Village Administration	Mwabomba, Mwime villages for Shinyanga and Nkonkilangi and Sambaru for Singida district Village Councils (VC) Village Environment Committees	Responsible for people's welfare in the Village and responsible for Village development. They oversee the general community's welfare (in terms of People's rights, environment, security, welfare, etc).
Institutions	The local existing community institutions such as schools, police churches, mosques, hospitals, CBOs, and NGOs,	Responsible for the provision of social services (health, education, safety, security, worshiping, and education but could also take part in observing the environment.
Community	Community members at Mwabomba, Mwime for Shinyanga and Nkonkilangi and Sambaru for Singida district, Religious leaders, traditional leaders, Influential	These are communities in proximity to the Project area and are responsible for providing necessary inputs during Project planning and will be potentially impacted by the mining activities
Individuals/ groups	PML and Surface Rights Owners, Groups Managing the PMLs	Community members located in the Project area and may directly be impacted by the Project, in terms of relinquishing their surface rights for the project and have a potential to be either economic/physically displacement.

8.3 Notification and Consultation Methodology

8.3.1 Notification

Stakeholders should be notified as early as possible so they can understand the agenda that are going to be discussed and are able to make it to the meeting venue to voice their concerns or proposals, the project team made appointments with all the stakeholders at least a week before the engagement date through phone calls. The meeting venue was agreed by the target groups and the team followed the stakeholders to their places of work e.g. mining area, cooperatives offices, village and ward offices, schools, etc.

8.3.2 Consultation Methodology

The methodology employed included:

- One-to-one meetings with the government Chemist Laboratory Agency (GCLA),Mwanza, Lake Tanganyika Basin Water Board, Shinyanga, and Singida Regional Management Team and For Shinyanga Region (Kahama Municipal) and Singida Region(Ikungi and Iramba Districts)
- Focus group discussions with the For Kahama district (Mwabomba and Mwime Ward leaders) and Singida district (Nkonkilangi and Sambaru wards leaders) as well as ward development committee, Police

8.4 Stakeholder Consultation Meetings Conducted

Various consultative meetings were conducted at various levels of administration involving such as Government Agencies, Regional and District authorities, Ward, Village Governments, and local communities.

8.4.1 Regional Level

A meeting was held with the assistant of the Regional Commissioner (RC), RAS, RMO-Mines, and RMO, RPC at their respective offices on November 7th, 2023, at the RC office in Shinyanga, and on November 11th, 2023, at Singida to present information on the ESIA process and to obtain the Regional administrative leader's opinions about the process. The RC was also informed about the meetings conducted at the local level and was briefed on community concerns.

Figure 8-1: ***Consultative meeting with RPC -Shinyanga,7th Nov 2023 (Source: City Engineering Co. Ltd Field Study)***

8.4.2 District Level

The second meeting took place on November 8, 2023, with the Kahama Municipal. Attended by the District Executive Director (DED) and Heads of Departments, the meeting aimed to apprise the authority of the proposed project and gather essential data to comprehend baseline conditions. The discussion included an overview of the project and the Environmental and Social Impact Assessment (ESIA) process. Notably, significant concerns were raised and thoughtfully integrated into the ESIA planning. Another meeting was held at the District Commissioner's (DC) office, where the focus was on updating the DC on the overall progress of the ESIA studies.

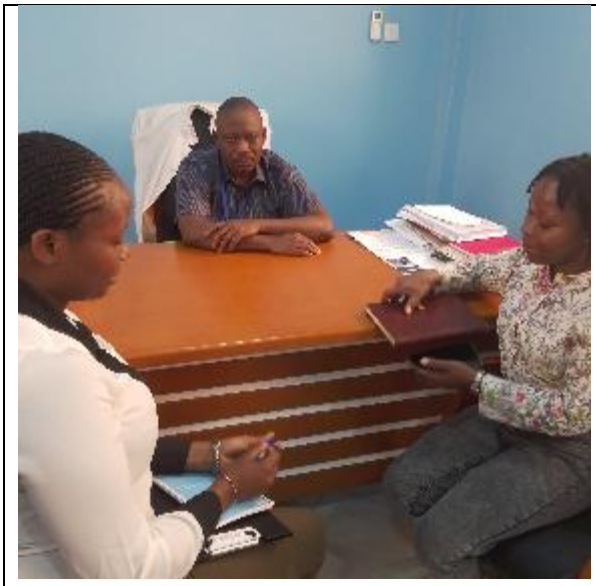
Similar activities occurred in Iramba district on November 14, 2023, and Ikungi on November 16, 2023. In the Ikungi district, the ESIA study faced a challenge due to a Regional Commissioner's visit, resulting in the majority of the District leaders being unavailable. As a workaround, the study proceeded with the Assistant DED and Assistant Heads of Departments

8.4.3 Government Agencies

Meetings were held with the representatives from the Government Agencies between 6th, 7th, and 13th Nov 2023, The government agencies involved in the ESIA consultation process including the Government Chemist Laboratory Agency (GCLA), TFS, and Lake Tanganyika BWB These agencies were consulted for the oversight of soliciting views and significant concerns on policy and regulatory responsibilities of the agencies with regard to the Project. Comments from agencies have been the key to ensuring that Project activities conform to legislative requirements and procedures**.**

8.4.4 Ward Level and Village Level

Focus Group Discussions (FGDs) with the Ward Development Committee (WDC) and Village Council, Ward and Development Committee for the Environmental and Social Impact Assessment (ESIA) were conducted on November 9, 2023, in Mwabomba and Mwime, located in Shinyanga. Additionally, sessions were held on November 15, 2023, in Nkonkilangi, and on November 17, 2023, in Sambaru, Singida. The participants included Ward Councillors, Ward Executive Officers (WEOs), Village Executive Officers (VEOs), Village Chairpersons, and development committees, Influential and religious leaders, and traditional leaders. The primary objectives of these meetings were to provide information about the proposed project, explain the ESIA process, and gather data on socio-economic baseline information in the local study area, encompassing aspects such as health, education, police, and livelihood activities

	
A consultative meeting with MMO-Kahama 8th Nov 2023	**A meeting with Village Council, Twike ward at Nkokilangi village 15th Nov 2023**
	
A FDG with small miners, Mwabomba, 9th Nov 2023	**A consultative meeting with TFS-Shinyanga field study 7th Nov 2023**
	

A consultative meeting with RMO-Kahama 7th Nov 2023	**A FGDs with ward C-Mwabomba village Office 9th Nov 2023**

Figure 8-2: Stakeholder Consultation Meetings with Various Project Stakeholders (Source: CECL Field Study Nov 2023)

8.5 Stakeholders Comments and Concerns

Notes were taken during consultation with the various stakeholders for the project so as to have a record of the information that was exchanged and these are summarized in Table 8-2.

8.6 Grievance Redress System

In Kahama MC, specifically in the villages of Mwabomba, the grievance resolution process involves lodging complaints with the village and ward executives. These local leaders work to address and resolve issues, although there have been instances where delays occurred, and due to the absence of a police station, all grievances are directed at the village executives.

8.6.1 Grievance Redress Mechanism

At project level a Grievance Redress Mechanism (GRM) will be established to allow community members, workers, and other stakeholders to raise complaints or concerns related to the project. Complaints can be submitted verbally or in writing through local leaders, GRM Committee, project representatives, phone calls, or suggestion boxes.

All grievances shall be recorded, investigated, and resolved within defined timelines. Sensitive cases, including GBV and SEA/SH, will be handled confidentially and referred to appropriate service providers.

Table 8-2: Record of the Stakeholders' Concerns and Responses

STAKEHOLDER	ISSUE/CONCERN	RESPONSE	COMMENT/ RECOMMENDATION
Regional Commission Office-Shinyanga Mr. Fabian Kamoga (PARC) Date: 07/11/2023	What do you think will be the positive and negative impacts of the proposed project	Firstly, this is a commendable initiative that not only demonstrates a great idea but also provides substantial support to small miners in the ASGM sites to equip them with knowledge and technology to safely continue to undertake their livelihood activities	The mining office should ensure that individuals applying for mining licenses are genuinely involved in mining activities
		Local-level stakeholders, including ward and village governments, should actively participate in understanding any issues at the project site, and their involvement will be crucial in supporting the project	The involvement of local administration and community in different matters regarding the project should be done continuously
Regional Adminstrative Secretary Prof,Siza Tumbo RAS-Shinyanga region Date 07/11/2023	What do you think will be the positive and negative impacts of the proposed project	The envisioned project promises numerous positive impacts for small miners, fostering a comprehensive understanding of safety measures and protective considerations in their mining processes, thereby contributing to the well-being of the entire community It is necessary for the NEMC to start planning for the suistainability of this project by understand applicability, community identity, how to ensure the loan taken for implementing project will return back NEMC should also concider providing more training to the small miners	NEMC should have the sustainability plan for the project and share it with the Regional and RAS office for the advise

STAKEHOLDER	ISSUE/CONCERN	RESPONSE	COMMENT/ RECOMMENDATION
Regional Mines Officer (RMO) Shinyanga Lucy Kimaro -Ag RMO Said J.Omary - Technician Date: 07/11/2023	What do you think will be the positive impacts of the proposed project	This commendable project holds significant positive impacts. However, the NEMC needs to prioritize additional training for small miners, focusing on safe mercury handling and the use of protective gear, By extending this training to the community, we can dispel any negative perceptions surrounding the project and ensure its success. The ESIA report from NEMC and the certificate are to be shared with the RMO Office so that they can see what was included in the report to assist the Environment Officer at the RMO office in following up on the mine commitments and other project requirements	N/A
		It will support the small miners to undestand the best and safety mechanicanism of handling mercury Creation of awareness to the community leaders so that they can provide full support during the implementation of the project	NEMCs should engage the community members opinion for effective implementing the project
	What do you think will be the positive impacts of the proposed project	Small scale miners contribute significantly to the development of the region and support numerous livelihoods especially in this region hence efforts to find safe way of handling mercury will be great and positive project for the ASGM and the community in generally, RMO mining office providing training about this but having the centre for showing the ASGM how to handle the safe use of this chemicals will be helpful project	NEMC should plan and prepare the Monitoring and evaluation plan for ensuring the effectiveness implementation of the project

STAKEHOLDER	ISSUE/CONCERN	RESPONSE	COMMENT/ RECOMMENDATION
Regional Medical Officer (RMO) Shinyanga Shinyanga region Dr,Yuda Ndagugile - RMO Neema Simba-RHO Mussa Makungu-RIDSR,EHO Date: 07/11/2023		NEMC should ensure they conduct continuously monitoring and evaluation of the project after they construct to make sure ASG Understand the applicability of the project and its advantage	
	What are the most diseases reported to you from the mining areas? Is there any mercury disease incidence	● Sexually Transmitted diseases ● UTI ● TB No, considering that no proper research has been conducted in the area to determine the causes of mortality related to mercury exposure, it is noteworthy that there have been no reported deaths directly attributed to mercury in our office	NEMC should consider conducting research on the effect of mercury
Regional Commander Police- RPC ACP S.Magomi Date: 07/11/2023	What do you think will be the positive impacts of the proposed project	Firstly the small miners will learn safety measures NEMC should start implementing the project since there is so many incidences of ASGM to die in the shaft so for this government project will support the ASGM in using the protective gears and other PPE	
	Is there any incidence of death reported from mining	No,	

STAKEHOLDER	ISSUE/CONCERN	RESPONSE	COMMENT/ RECOMMENDATION
Regional Fire Officer SR Martin Nyambala (RFO) Date: 7th Nov 2023	What do you think will be the positive impacts of the proposed project	● It will help the ASGM to understand the proper use and handling of mercury for the health and environment considering the mercury is very dangerous chemicals ● Increase in money circulation in society, after they understand the safety measure will likely also increase their production and more people will be involved in various economic activities but also environment-friendly	NEMCs should consider sharing the structure layout to the Fire officer for the advice before they start the construction NEMC should consider providing education to the ASGM and the new technology equipment which will detect the consumption of the mercury to the AGSM NEMC should work very closely with the Fire department in the respective areas to minimize risk which will likely occur
	Negative impacts	● Moral decay and destruction of indigenous culture due to the interaction of different people with different backgrounds. ● Increase in early pregnancies and school dropouts.	NEMCs should work closely with the District Cultural officer to maintain and preserve the indigenous

STAKEHOLDER	ISSUE/CONCERN	RESPONSE	COMMENT/ RECOMMENDATION
		● There has been an increase in prostitution and other immoral behaviors which results in the spread of diseases such as HIV and STDs since more people will also engage in mining	culture of the community members in mining sites NEMC should keep encouraging SHEDAF organization which works in some of the districts in Singida to oversees the HIV and STDs in particularly providing more education
TFS-Shinyanga **Franaeli Sumari** Date: 7th Nov 2023		This project will be very beneficial for small-scale miners. They will be able to learn safe health and environmental practices, as well as effective ways to protect themselves. I thought that NEMC (National Environment Management Council) could also include an environmental conservation aspect by examining how small-scale miners can reduce the use of trees in mines, as it significantly harms the environment	NEMC need to collaborate with other institutions to see how they can advise ASGM to use other alternatives instead of using trees in the shaft
Kahama Municipal District Executive Director**-DED** **Mr, Anderson Msumba** Date: 8/11/2023	What do you think and opinion about the proposed project for the small miners and the community to save	Small miners are surrounded by a low standard of living, so the risk is even higher. Many of them live in these areas and engage in vegetable farming. Often, water flows from the mines, and it contains mercury. Therefore, when this project begins, it will be of great assistance to them	Noted
		The perspective might be slightly different because they believe in traditional healing methods, but with additional	NEMC should plan to create awareness to the ASGM and

STAKEHOLDER	ISSUE/CONCERN	RESPONSE	COMMENT/ RECOMMENDATION
		education provided by NEMC, they will understand the project	the community about the project
Kahama Municipal **Social Welfare Officer** Swahiba Mcemchem Date: 8/11/2023	Are there cases of the GBV and VAC in the small-scale mining reported to your office	There have been numerous incidents of Violence against many children, with many being abandoned or engaged in small commercial activities around the mine. Our office receives cases of up to 500-800 for children per year. Many of these children are found to have parents who have moved from neighboring countries or regions such as Bukoba, Ngara, and Biharamulo, who come with their parents in search of income. The office collaborates with private children's homes to care for abandoned children, and one center has a total of 170 children.	It is a good idea for the NEMC to propose to the Regional and district management how to address this challenge
Emanuel Mbise **Operation Manager** Small miner -Vicent Benedicto Busigwa	Is there any challenge you faced as a small miner	Small-scale miners face a myriad of challenges, notably with the local machinery they utilize. These machines not only escalate workload, leading to diminished production but also pose safety hazards to their health The equipment for small-scale mining requires the stones to be sun-dried before they can be processed into powder. Unfortunately, this step often causes delays in our operations, as we have to wait for the rain to stop.	I propose that NEMC in their demonstration centers put the advanced machines that can grind stones directly into the mud and incorporate any stone capabilities whether it is dry or not, the production process will become more efficient, minimizing dust and addressing the challenges miners face, particularly during rainy seasons when work is often delayed until the rain stops. This innovation not

STAKEHOLDER	ISSUE/CONCERN	RESPONSE	COMMENT/ RECOMMENDATION
			only improves productivity but also makes the mining process less dependent on weather conditions.
		Another challenge is Winches for lifting stones from the shaft, most of the small miners carry soil and stones in mines using ropes, which remains a significant challenge and heavy workload for the small miners	NEMC should consider putting the winches in the demonstration centre so that the miners will learn how this winches simplify work and mitigate dust emissions
DEMO-Kahama **Johaness Mweesa** Date: 8/11/2023	How is the community around mining handle waste	Majority of the small miners and the community around use pits to collect the waste solid.	Waste Management has been observed to be a challenge during the site visit to the local community, thus Education on

STAKEHOLDER	ISSUE/CONCERN	RESPONSE	COMMENT/ RECOMMENDATION
			waste handling should be provided.
Village Council, WD and Ward Council , Influential,religious leaders, traditional leaders **Mwabomba -Kahama** Date: 9/11/2023	What is your main economic Activity in this area	Small scale agriculture, Mining, keeping of livestock and small business	N/A
	What do you think is the positive and negative impact of the proposed project	Firstly, we will attract many migrants who, upon learning that there is a place where miners can learn about mercury, will contribute to the development of our village, leading to an increase in the circulation of money. Secondly, this project will be immensely beneficial to small-scale miners. Small miners engage in mineral processing without regard for their health and safety. Consequently, the project holds immense potential to benefit not only the miners but also the broader community. Mining operations often involve the use of water, and the inadvertent flow of this water into local water sources poses significant health and environmental risks to the community.	N/A
	Are there any incidences or cases reported at the Village office caused by the mining	Yes, 5 cattle entered the plant in Mwabomba village and died, but it was accidentally done, as in many enclosures, these plants are usually fenced	RMO needs to continue providing education about this

STAKEHOLDER	ISSUE/CONCERN	RESPONSE	COMMENT/ RECOMMENDATION
	Where do you source water for your daily uses?	We source our water from the borehole which is located about 25 minutes from my house in the private borehole where he provides the water for free.	N/A
	How far is a primary school from your house?	It is a walkable distance of about fifteen minutes since there is 6 primary school and 2 secondary schools in the ward	N/A
	Are there gender or VAC issues reported to your office?	Yes. cases reported for child abandonment.	All gender violence issues should be reported to the village government for further action. More awareness on gender-related issues to be provided to the community.
	What can you tell about the security of this area?	In this place there is good security we receive only minor cases such as misunderstandings and cases of debt coming from the small miners, despite we don't have a police station, we don't receive the bad cases	N/A
	What type of toilet do you use?	Pit Latrine and others don't have toilets	N/A

9 Environmental and Social Monitoring Plan

Environmental monitoring aims to assess the effectiveness of mitigation and management measures implemented in the Environmental and Social Management Plan (ESMP). When deviations from set standards or expected trends occur, monitoring results provide an opportunity to adjust mitigation strategies promptly. The monitoring program also identifies any adverse changes in the surrounding environment due to project operations. Responsibility for environmental and occupational health and safety monitoring lies with the HSE Manager, who coordinates with other departments to address the impact generated from project activities to ensure adherence to the monitoring plan.

Mwabomba Site management will prepare monitoring procedures for each environmental setting as per local and internationally acceptable standards. This will ensure that the Monitoring plan for the given mitigation measures is accurately and properly done. The procedure will detail the attributes to be monitored, frequency, and institutional responsibility.

9.1 ASPECTS OF ENVIRONMENTAL MONITORING SYSTEM

In order to minimize the adverse impacts of the project to as low as practicable with the current best practice, local and international conditions and in a cost-effective manner, the monitoring program will include the below aspects of the physical, biological and social environment:

- Water Resources: Water quantity and quality,
- Operations Aspects: Health and safety data, different types of wastes generated, treated, recycled and disposed of, incidents and potential incidences of environmental risks e.g. worker's injuries, noise impact, unpermitted land disturbance.
- Noise and Vibration
- Dust emission

The monitoring program will associate with on-site sampling collection by an HSE expert of which samples will be sent to an accredited laboratory for analysis. Parameters will be analyzed according to environmental quality standards as developed under the Environmental Management Act, of 2004 and results will be compared against the standards as well as baseline information.

The current cost of managing and implementing the site's Environmental Monitoring Plan is determined within the annual budget, utilizing monitoring procedures established at the project site the estimated annual cost for managing and implementing the site's environmental monitoring is TZS10,500,000. Table 11 below outlines the monitoring plan for the proposed project.

Table 3: Environmental and Social Monitoring Plan

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
Construction Phase					
Construction of sluices, VAT leaching tanks, drainage, and amalgamation pool	Generation of dust from cement works	• Ensure construction workers receive training prior to commencing work • Provide PPE and enforce usage • Engage HSE Officer as part of the construction crew • Promote good cement handling and limit wasteful practices	NEMC & HSE Manager	Standards included in the Environment Management (Air Quality Standards) Regulation,2007 & WBG HSE Guideline (PM2.5 25 µg/m³ PM10 50 µg/m³)	10,000,000
	Potential for accidents due to falling in the foundation and sluice drainage/sediment trap excavations, and from working at height	• Demarcate all areas with falling hazards • Provide scaffolding for persons working at height • PPE and enforce usage • Ensure Job Safety Hazard analysis is conducted before commencing work and required mitigation measures are in place		Zero incidents	Already included
	Potential for accidents due to falling objects	• Ensure safety signs are placed in strategic areas to provide warning • Provide PPE and enforce usage • Provide tool-holding equipment for persons working at height		Zero incident	Already Included
	Health and safety risks due to manual heavy lifting	• Provide manual handling and lifting training. • Use mechanical lifting and transporting equipment/ devices e.g. pulley,			

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	Generation of construction wastes (cement bags/mixed cement/concrete	• Institute a waste management program that promotes waste segregation • Have a recyclable waste storage facility that is secured • Identify permitted contractors/persons who can collect and recycle the wastes • Avoid wasteful practices • Use hardened cement and concrete debris as core		Minimal waste generation	NA
Rehabilitation of degraded land, landscaping and tree planting	Improved health and safety due to backfilling of mining pits and excavations and levelling the ground	• Landscape the area to promote aesthetic appeal • Plant trees and vegetation that are common to the floristic region • Use drought-resistant and low-maintenance vegetation	HSE Manager	Improved ecology of the area	20,000,000
	Exposure to loose soil that may wash into waterways and cause siltation	• Landscape to ensure no scouring/erosion-promoting slopes • The landscaping should ensure minimal areas are left bare • Include sedimentation basins in the drainage		Minimum soil disturbance within the project footprint	
	Change in drainage patterns	• Landscape according to the natural topography, ensuring free draining • Include water crossings for areas with defined drainage channels		Restored drainage channels according to topographical	
	Improved biodiversity due to encouraging and planting vegetation	• Landscape the area to promote aesthetic appeal • Plant trees and vegetation that is common to the floristic region		Restored ecology of the area	

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
		• Use drought resistance and low-maintenance vegetation that can thrive without the need for care			
	Improved aesthetics	• Landscape the area to promote aesthetic appeal • Plant trees and vegetation that is common to the floristic region • Use drought resistance and low-maintenance vegetation that can thrive without the need for care		Restored ecology of the area	
Transit of supplies and project personnel to and from the site	Increased traffic increases potential for accidents in the community especially for children	• Ensure traffic management rules are in place and communicated to employees • Provide awareness to the community members • Ensure operators are trained and certified according to the national driving requirements and in addition the project specific drivers training • Liaise with TARURA and install safety signs on community roads	HSE Manager	Zero Accident	3,000,000
Use of heavy equipment	Potential for hydrocarbon spills	• Contractor will be required to use appropriate fuelling equipment with spill prevention measures when refueling onsite • Spill kits should be available and contaminated soil should be taken away immediately to soil remediation unit for treatment and final disposal as per the approved management plan • Use of plastic drums and mats under heavy	& HSE Manager	Zero Spills	3,00,000
Provision of food to employees	Generation of food waste	• Engage local food vendors who will prepare food offsite and bring food in reusable utensils and containers	Plant Manager and HSE Manager	Improved hygiene	3,000,000

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
		• Properly segregate food waste to ensure no harmful objects are contained and identify recycling opportunities • Consider having a composting unit • Ensure eating area is kept clean and dust bin sealed to discourage vermin infestation			
Provision of drinking water	Potential for communicable diseases due to use of unsafe water supply	Ensure access to adequate amounts of potable water		Sufficient supply of clean water	
	Generation of light plastics waste (water bottles)	• Ensure recyclable plastics collection point is available • Engage plastic waste collectors who are operating in Kahama town and identify economical means to promote recyclable waste collection		Timely collection of waste to disposal site	
	Increased water demand in community water supply	Consider provision of bottled water or bulk water supply		Available clean water	
Employee hygiene	Potential for spread of communicable diseases due to use of unsanitary washrooms	• Provide adequate facilities for sanitary convenience e.g. mobile toilets and mobile septic tanks • Engage cleaner to ensure that they are kept in hygienic conditions • Frequently empty full sewage tanks utilizing permitted contractors	& HSE Manager	Zero discharge of domestic waste	10,00,000
Sourcing of Labor	Immigration of construction workers	• Adopt principles included in Labor Management Plan where unskilled workers will be local hired through the village authority • No migrant Labor will be employed by the project	Plant Manager	Local people employed	NA

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
		• Specialized work will be undertaken by contractors who will be responsible for managing their employees			
	Unfair employment terms to local people	• Include adherence to Labor requirements in contracts for engaged contractors • Ensure that employees are provided with contracts as per Employment and Labor relations act 2004 • Ensure Labor rights and responsibilities specific training is provided to both contractor and employee the district authority responsible for Labor • Ensure the project and contractor has a grievance mechanism and that employees are aware of it	Plant Manager	• Signed contracts • Grievance mechanism procedure	Included in project investment cost for employees
	Unfair employment terms to Women	• Include adherence to Labor requirements in contracts for engaged contractors		Reasonable contracts as per industry needs	
	Potential for child Labor	• Include adherence to Labor requirements in contracts for engaged contractors		No Child under the age of 18 year to be employed	
Risk of SEA/SH against women and girls (workers and community members)	Limited social protection increased vulnerability	Lead GBV/SEA/SH awareness sessions with community leaders and groups. Post Swahili GBV reporting posters in public areas. Establish a confidential reporting system via focal persons or women's group leaders. Train workers on zero-tolerance for harassment, sexual favors, and violence. Require all workers to sign a Code of Conduct.		Women workers	

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
Demobilization of construction workers	Increase number of single women and child headed families due to abandoning families	• Provide awareness to project employees and community pertaining to interactions • Ensure the project and contractor has a grievance mechanism and that employees are aware of it • Engage local NGOs who work on these matters to assist	NEMC, Plant Manager and HSE Manager	Resolved grievances	
Operation Phase					
Drying of ore	Health and safety risks due to manual heavy lifting	• Provide manual handling and lifting training. • Use mechanical lifting and transporting equipment/ devices e.g. pulley,	Plant Manager and HSE Manager	Zero incident	Included in the cost below
	Generation of sediments that may wash into waterways	Construct drainage around the site and sediment trap prior to discharge		Less or no sediments loosely available	Included in investment cost
Crushing of ore using hand hammers	Generation of undesirable level of noise the neighbours at the adjacent guest house and shops/bars	• Conduct activities during daytime hours • Provide hearing protection to employees		The Environmental Management (Standards for The Control of Noise and Vibration Pollution) Regulations, 2011) & WBG HSE Guideline 70dBA for site and 55Dba and 45dBA at nearby receptors at night and day hours	30,000,000
	Generation of dust exposure to workers	• Ensure workers receive training prior to commencing work • Provide PPE and enforce usage • Engage HSE Officer as part of construction crew • Install mechanical crusher plants • Apply water as dust suppressant in mechanical crushers			

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	Increased potential for finger injuries due to the use of hand hammers	• Provide PPE and enforce usage • Ensure job hazards analysis is conducted and mitigation measures are in place • Install mechanical crusher plants		Zero incident	
	Exposure of children to mine hazards due to being at the mine site with mothers for care	Liaise with NGOs and community on the support system for child care while the mother is working		No Child employment	
Grinding/milling using crushers	Generation of undesirable levels of noise	• Conduct activities during daytime hours • Provide hearing protection to employees		Zero incident	
	Generation of dust	• Conduct activities during daytime hours • Provide respiratory protection to employees		Standards included in the Environment Management (Air Quality Standards) Regulation,2007 & WBG HSE Guideline 70dBA for site and 55Dba and 45dBA at nearby receptors at night and day hours	
	Potential for injuries due to being exposed to moving parts of the crusher	• Provide mechanical guards • Isolate the crushers to limit access of		Zero incident	
	Generation of metal waste (steel balls and work crushers)	Engage recyclable waste contractors		Minimal waste	
Supplying of power to the crushers	Generation of noise from the onsite generators	• Improve availability of national grid power • Conduct activities during daytime hours • Provide hearing protection to employees		Reliable source of power	

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	Emission of noxious gases from generators	• Improve availability of national grid power • Service generators as per manufacturer's recommendations		Standards included in the Environment Management (Air Quality Standards) Regulation,2007 & WBG HSE Guideline for ambient air quality standards	
	Increased potential for hydrocarbon spills polluting land and water	• Generators should be placed in enclosures with their covers in place • Service generators as per manufacturer's recommendations • Provide spill kits		No Spills	
	Potential for fire from power generators	• Service generators as per manufacturer's recommendations • Install fire extinguishers within proximity of generators		Zero source of fire hazard close to the generator	
Sluicing	Potential for inhalation of dust during handling of milled ore	Provision of PPE to workers		Standards included in the Environment Management (Air Quality Standards) Regulation,2007	
	Increased water demand for sluicing	Continue practice of removing sediments and reusing excess water		Re-use of water	
	Generation of sediment loaded waste water	Install sediment traps at discharge sites		Best Industrial Practice	

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	Increasing potential for sedimentation in water resources due to improper storage of generated tailings	Improve facilities for tailings storage to have cut off drainage that isolates the tailings from runoff			
	Potential for slip and fall and drowning from the sluicing plant drainage and sediment traps	• Provide covers for the drainage system • Barricade the drainage to limit exposure		Zero incident	
Amalgamation	Exposure of employee's elemental mercury by contact which can lead to serious health effects such as neurological and behavioral disorders, kidney damage, respiratory problems, and even death	• Provide hand and respiratory PPE • Ensure enough ventilation		Zero incident	
	Generation of waste water that contain mercury in the amalgam pool which could potentially contaminate sources of water in not disposed according	• Provide training on how to improve panning process to increase mercury recovery • Reuse water in the amalgamation pool in panning		Zero discharge to environment	
	Generation of mercury laden tailings	Improve facilities for tailings storage to have cut off drainage that isolates the tailings from runoff	HSE Manager and Plant Manager	Zero Discharge	Included in project Investment cost
	Generation of gold that contains mercury as impurity	Use retort in removal of excess mercury from amalgam to promote recapture and reuse		Zero discharge to environment	
	Promoting continued mercury production and trade	• Investigate on increasing efficiency, availability and cost effectiveness of non-mercury processes • Investigate on mechanisms that can provide subsidy to VAT chemicals so they can be more affordable to ASGM	NEMC	NA	Included in Investment cost

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
		• Encourage banks to provide finance ASGM eliminating the need for quick cash to finance mining operations and VAT extraction that leads to requiring fast cost-effective leaching using mercury			
Removal of mercury and impurities in gold amalgam via heating	Increased demand for charcoal and firewood	Use alternative energy sources e.g. LPG and acetylene blow torch	NEMC	Clean energy	
	Release of mercury in air causing pollution	• In cooperation with ASGM investigate on how to promote the use of retorts and/or fume hoods. • Enforce regulations mandating the use of retort	NEMC and HSE Manager	Standards included in the Environment Management (Air Quality Standards) Regulation,2007 & WBG HSE Guideline ffor Air Quality	
	Exposure of employees to mercury aerosols can lead to serious health effects such as neurological and behavioural disorders, kidney damage, respiratory problems, and even death	• In cooperation with ASGM investigate how to promote the use of retorts and/or fume hoods. • Enforce regulations mandating the use of retort			
	Generation of ashes that may contain mercury	Improve facilities for ashes storage to have cut-off drainage that isolates the ashes from runoff			
	Generation of mercury-contaminated waste from utilizing retort	ASGM should have facilities for the storage of mercury-contaminated waste. E.g. steel drums used to supply metal balls for the mills			
VAT Leaching of tailings	Exposure of employees to hazardous chemicals (Cyanide and Lime) can lead to serious health effects such as neurological and behavioural disorders, kidney damage, respiratory problems, and even death	• Ensure workers receive training prior to commencing work • Provide PPE and enforce usage • Have a chemical handler trained and certified by GCLA	HSE Manager	Zero incident	Already included

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	Generation of mercury and other leaching by products laden tailings	Remove mercury from tailings obtained from amalgamation pool prior to VAT leaching		Zero discharge to the environment	NA
	Increased water demand	Improve water recovery and management to reduce the need for fresh water			NA
	Exposure of employees to drowning in the VAT tanks	Provide barricade and warning signs at leach tanks		Zero Incident	Already Included
	Generation of chemical wastes from packaging	MC/NEMC/GCLA to provide affordable access to chemical waste dealers to ASGM		No discharge to environment	Included in investment cost
	Requirement of skilled Labor	• GCLA in collaboration with MC to provide training to ASGM • Require ASGM have formally trained employee in their structure		Trained employees	Already Included
Provision of food to employees	Generation of food waste	• Discourage food consumption at site • Provide employees with lunch break so they can go and eat elsewhere	HSE Manager	No food consumption at site	NA
	Consuming contaminated food (Mercury/dust) as most eat at their worksite	• Discourage food consumption at site • Provide employees with lunch break so they can go and eat elsewhere	HSE and Plant Manager		
Provision of drinking water	Potential for communicable diseases due to use of unsafe water supply	Ensure access to adequate amounts of potable water	HSE Manager and Plant Manager	Sufficient supply of clean water	NA
	Generation of light plastics waste (water bottles)	• Ensure recyclable plastics collection point is available		Recycling of plastic waste	5,000,000

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
		• Engage plastic waste collectors who are operating in Kahama town and identify economical means to promote recyclable waste collection			
	Increased water demand in community water supply	Consider provision of bottled water or bulk water supply			
Employee hygiene	Potential for spread of communicable diseases due to use of unsanitary washrooms	• Provide adequate facilities for sanitary convenience • Engage cleaner to ensure that they are kept in hygienic conditions • Frequently empty full sewage tanks utilizing permitted contractors		Adequately and clean sanitary facilities	Included in investment cost
Sourcing of Labor	Immigration of construction workers	Operational staff to be provided by the cooperative managing the PML	Plant Manager	NA	NA
	Unfair employment terms to local people	• Include adherence to Labor requirements in agreement with the cooperative • Ensure that employees are provided with contracts as per Employment and Labor relations act 2004 • Ensure Labor rights and responsibilities specific training is provided to both cooperatives managers and employee the district authority responsible for Labor • Ensure the project and contractor has a grievance mechanism and that employees are aware of it	Plant Manager	• Employment and Labor relations act 2004 • Contract availability • Presence of grievance mechanism	NA
	Unfair employment terms to Women	Include adherence to Labor requirements in contracts for engaged contractors		Contract signed for each employee	NA

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	Potential for child Labor	Include adherence to Labor requirements in contracts for engaged contractors			
Drying of ore	Health and safety risks due to manual heavy lifting	• Provide manual handling and lifting training. • Use mechanical lifting and transporting equipment/ devices e.g. pulley,	HSE Manager	Zero incident	Already Included
	Generation of sediments that may wash into waterways	Construct drainage around the site and sediment trap prior to discharge	Plant Manager	NA	Already included
Crushing of ore using hand hammers	Generation of undesirable level of noise the neighbours at the adjacent guest house and shops/bars	• Conduct activities during daytime hours • Provide hearing protection to employees	HSE Manager	Zero Incident	
Decommission/ Closure Phase					
Dismantling of mine and plant infrastructures and 'leveling	• Deterioration in ambient air quality due to dust and particulate matter (PM_{10} and $PM_{2.5}$) • Increased noise and vibrations that may lead to nuances and damages of properties • Deterioration of water quality affecting the use of ground water and surface water as a natural resource • Exposure of employees to hazardous chemicals (Cyanide and Lime) which can lead to serious health effects such as neurological and behavioural	• Provision of enough PPEs to all workers onsite and mandate their use • All dismantling activities should be limited in a day time • Assign qualified supervisors or safety officers to ensure that all safety protocols are being followed	NEMC and HSE Manager	• No incident Standards included in the Environment Management (Air Quality Standards) Regulation,2007 & WBG HSE Guideline ($PM_{2.5}$ 25 µg/m³ PM_{10} 50 µg/m³)	5,000,000
Generation and management of wastes		• Timely collection and removal of waste by a certified contractor • Good separation of waste • Proper disposal of hazardous waste through NEMC certified contractor	NEMC and HSE Manager	Zero Discharge	10,000,000
VAT closure activities					

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	disorders, kidney damage, respiratory problems, and even death	• Mark hazardous zones or restricted areas • Assign qualified supervisors or safety officers to oversee the operation and ensure that all safety protocols are being followed • Storing chemicals in appropriate containers, ensuring they are properly labelled, tightly sealed, and stored in designated areas away from water sources • Implementing measures to prevent spills, such as using secondary containment systems like spill berms or pallets to capture and contain leaks or spills • Keeping spill response kits readily available and ensuring they contain appropriate materials for containing and cleaning up hazardous chemicals • Developing and implementing proper drainage management systems to minimize the interaction of water from mine facilities and the receiving environment, particularly water sources			
Transportation of materials out of site	Accidents and injuries	• Provision of PPEs and enforcing their use during working hours • Mandate the use of appropriate Personal Protective Equipment, such as helmets, safety goggles, gloves, and high-visibility clothing, for all personnel operating or working in close proximity to heavy machinery • Provide trained First Aiders and first Aid kit at potential areas	NEMC and HSE Manager	Zero incident	Already included

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
		• Only qualified personnel should be employed • Engaging trained and certified drivers to ensure speed control & road safety			
Site leveling and revegetation	Introduction of invasive species	Wherever possible, use native plant species in re-vegetation and restoration programs to reduce the risk of introducing invasive vegetation species	NEMC and HSE Manager	No Invasive Alien Plant species, and the regrowth of indigenous species recorded	NA

10 EMERGENCY PREPAREDNESS AND RESPONSE PLAN

INTRODUCTION

Artisanal Small-Scale Gold Mining (ASGM) operations are often exposed to various hazards and emergencies due to the nature of their activities and working environments. This Emergency Preparedness and Response Plan (EPRP) is designed to provide clear and practical guidelines to effectively manage and respond to emergencies, ensuring the safety and well-being of all miners and associated communities.

SCOPE OF THE PLAN

This EPRP applies to all personnel involved in ASGM activities at the project area and covers the following emergency scenarios:

- Fire Outbreaks
- Pit Wall Collapse/Landslides
- Mercury Exposure and Poisoning
- Machinery and Equipment Accidents
- Medical Emergencies

The plan outlines the procedures, roles, responsibilities, and resources necessary to prevent, prepare for, respond to, and recover from these emergencies.

OBJECTIVES

The main objectives of this EPRP are to:

i. **Protect Human Life**: Ensure the safety and health of all miners and nearby communities.

ii. **Minimize Environmental Impact**: Prevent and reduce environmental damage during emergencies.

iii. **Reduce Property Damage**: Protect equipment and infrastructure from severe damage.

iv. **Ensure Efficient Emergency Response**: Provide clear procedures for prompt and effective responses to emergencies.

v. **Promote Preparedness**: Enhance awareness and readiness through training and regular drills.

EMERGENCY RESPONSE ORGANIZATION

Emergency Response Team (ERT)

Given the scale of ASGM operations, the Emergency Response Team comprises designated individuals with specific roles during an emergency.

Table 10-1: Team Structure and Roles

Position	Name	Contact Information	Responsibilities
Emergency Coordinator	[Name]	[Phone Number]	Overall coordination during emergencies; decision-making; liaising with external agencies.
Safety Officer	[Name]	[Phone Number]	Monitoring safety measures; conducting training and drills; assessing hazards.
First Aid Responder	[Name(s)]	[Phone Number]	Providing immediate medical assistance; maintaining first aid supplies.
Fire Safety Officer	[Name]	[Phone Number]	Managing fire prevention measures; operating firefighting equipment.
Communication Officer	[Name]	[Phone Number]	Disseminating information during emergencies; maintaining communication equipment.
Evacuation Leader	[Name]	[Phone Number]	Leading and coordinating evacuation procedures; ensuring all personnel are accounted for.

Note: All team members should be adequately trained for their roles and responsibilities.

EMERGENCY SCENARIOS AND RESPONSE PROCEDURES

Fire Outbreaks

Potential Causes

- Faulty electrical equipment.
- Improper storage of flammable materials.
- Open flames or unattended fires.
- Smoking in prohibited areas.

Prevention Measures

- Regular inspection and maintenance of electrical equipment.
- Safe storage of flammable substances away from ignition sources.
- Establishing designated smoking areas away from flammable materials.
- Training miners on fire safety and prevention practices.

Response Procedure

Immediate Actions:

i. **Raise the Alarm**: The person who discovers the fire should shout "FIRE" loudly and notify others immediately.

ii. **Notify Emergency Coordinator**: Inform the Emergency Coordinator or Safety Officer about the fire location and severity.

iii. **Evacuate the Area**:
- Proceed calmly to the nearest safe exit following designated evacuation routes.
- Do not attempt to collect personal belongings.
- Assist others in evacuating, especially those needing help.

iv. Attempt to Extinguish (If Safe):
- If the fire is small and manageable, trained personnel may attempt to extinguish it using available firefighting equipment.
- Do not take unnecessary risks; prioritize personal safety.

v. Assemble at Designated Safe Zone:
- Gather at the predetermined assembly point [Specify Location].
- The Evacuation Leader conducts a headcount to ensure everyone is accounted for.

vi. Contact External Support:
- If the fire is beyond control, the Communication Officer contacts local fire services through their phone number

vii. Do Not Re-Enter:
- No one should return to the affected area until declared safe by the Emergency Coordinator or relevant authorities.

1.1.1 Equipment and Resources
- **Fire Extinguishers**: Regularly serviced and easily accessible throughout the mining site.
- **Fire Blankets**: Available in areas with higher fire risks.
- **Sand Buckets**: Positioned near potential ignition sources.
- **Emergency Exits**: Clearly marked and unobstructed at all times.
- **Assembly Point Signage**: Visible signs indicating safe gathering areas.

PIT WALL COLLAPSE/LANDSLIDES

1.1.2 Potential Causes
- Unstable geological formations.
- Excessive excavation undermining structural integrity.
- Heavy rainfall weakening pit walls.
- Vibrations from machinery or nearby activities.

1.1.3 Prevention Measures
- Conduct regular assessments of pit wall stability.
- Implement proper excavation techniques maintaining safe angles and supports.
- Monitor weather conditions and cease operations during heavy rains.
- Limit vibrations by controlling machinery use near sensitive areas.

1.1.4 Response Procedure

Immediate Actions:

i. **Raise the Alarm**: Upon noticing signs of collapse (e.g., cracking sounds, falling debris), shout warnings and alert others immediately.

ii. **Evacuate the Area**:
- Move away from the collapse zone swiftly and calmly.
- Follow predetermined safe pathways away from potential secondary collapses.

iii. **Notify Emergency Coordinator:** Provide details about the incident's location, extent, and any known injuries.

iv. **Conduct Headcount:** Assemble at a safe distance [Specify Location] and perform a headcount to identify any missing persons.

v. **Rescue Operations:**
- If safe, trained personnel may attempt to rescue trapped individuals using appropriate equipment.
- Avoid further risks; await professional rescue services if the situation is dangerous.

vi. **Contact External Support:** Communication Officer contacts local emergency services and requests immediate assistance.

vii. **Provide First Aid:** First Aid Responder attends to injured individuals until professional medical help arrives.

1.1.5 Equipment and Resources

- **Safety Helmets and Protective Gear**: Worn at all times during operations.
- **Warning Signs and Barriers**: Indicating hazardous zones and unstable areas.
- **Emergency Excavation Tools**: Shovels, ropes, and other tools for rescue efforts.
- **Communication Devices**: Radios or mobile phones for quick communication during emergencies.

MERCURY EXPOSURE AND POISONING

1.1.6 Potential Causes

- Improper handling and use of mercury during gold extraction.
- Lack of protective equipment when processing with mercury.
- Spillage or contamination of water and soil with mercury.

1.1.7 Prevention Measures

- **Training**: Educate miners on safe mercury handling and alternative gold extraction methods.
- **Protective Equipment**: Provide and enforce the use of gloves, masks, and protective clothing.
- **Proper Ventilation**: Ensure processing areas are well-ventilated to prevent inhalation of fumes.

- **Spill Management**: Establish procedures for safely containing and cleaning mercury spills.
- **Storage**: Store mercury securely in sealed containers away from living and eating areas.

RESPONSE PROCEDURE

Immediate Actions:

- **Identify Exposure**: Recognize symptoms such as tremors, headaches, respiratory issues, or skin irritation.
- **Remove from Exposure**:
  - Move the affected person to fresh air immediately.
  - Remove any contaminated clothing carefully.
- **Provide First Aid**:
  - Wash affected skin areas with soap and water.
  - If inhaled, ensure the person rests and breathes fresh air.
  - Do not induce vomiting if ingested; provide water to drink if conscious.
- **Seek Medical Attention**:
  - Contact local healthcare facilities or poison control centers for immediate assistance.
  - Transport the affected person to the nearest medical center if symptoms are severe.
- **Contain and Clean Spills**:
  - Evacuate and ventilate the area.
  - Use appropriate mercury spill kits to collect and contain the mercury safely.
  - Avoid using vacuum cleaners or brooms which can spread mercury particles.
- **Report Incident**:
  - Document the exposure incident and response actions taken.
  - Review and improve safety measures to prevent future occurrences.

1.1.8 Equipment and Resources

- **Mercury Spill Kits**: Including sulfur powder, gloves, masks, and collection containers.
- **Personal Protective Equipment (PPE)**: Gloves, masks, protective eyewear, and clothing.
- **First Aid Kits**: Stocked with supplies suitable for treating chemical exposures.
- **Emergency Contact Information**: Readily available numbers for medical facilities and poison control centers.

MACHINERY AND EQUIPMENT ACCIDENTS

1.1.9 Potential Causes

- Lack of proper training on equipment use.
- Operating faulty or poorly maintained machinery.
- Ignoring safety protocols during operation.
- Fatigue or negligence during work.

1.1.10 Prevention Measures

- **Training**: Ensure all operators receive comprehensive training on machinery use and safety.
- **Maintenance**: Conduct regular checks and maintenance of all equipment.
- **Safety Protocols**: Develop and enforce standard operating procedures for machinery use.
- **Protective Gear**: Mandate the use of appropriate PPE such as helmets, gloves, and safety boots.
- **Work Scheduling**: Implement reasonable work hours to prevent fatigue-related accidents.

1.1.11 Response Procedure

Immediate Actions:

i. **Stop Operations**: Immediately turn off and secure the machinery involved in the accident.

ii. **Assess the Situation**:
   - Check for injuries and the condition of the injured person(s).
   - Identify any ongoing hazards (e.g., leaks, electrical risks).

iii. **Provide First Aid**:
   - Administer appropriate first aid based on the injury.
   - Do not move the injured person if spinal injuries are suspected unless necessary for safety.

iv. **Contact Medical Services**:
   - Call local emergency medical services for assistance.
   - Provide clear information about the nature and severity of injuries.

v. **Secure the Area**:
   - Keep non-essential personnel away from the accident scene.
   - Preserve the scene for any necessary investigations.

vi. **Report the Incident**:
   - Document the details of the accident including time, location, causes, and actions taken.
   - Review and update safety measures to prevent future incidents.

1.1.12 Equipment and Resources

- **First Aid Kits**: Accessible and well-stocked for treating various injuries.
- **Emergency Shut-off Mechanisms**: Clearly marked and functional on all machinery.
- **Communication Devices**: For immediate contact with emergency services.

- **Accident Report Forms**: Simplified forms to document incident details promptly.

    - **MEDICAL EMERGENCIES**

1.1.13 Potential Scenarios

- Sudden illnesses (e.g., heart attacks, strokes).
- Severe allergic reactions.
- Heatstroke or dehydration.
- Snake bites or insect stings.

1.1.14 Prevention Measures

- **Health Assessments**: Conduct regular health check-ups for miners.
- **Awareness**: Educate personnel on recognizing signs of common medical emergencies.
- **Hydration and Rest**: Ensure access to clean drinking water and adequate rest periods.
- **Environment Safety**: Keep work areas clear of hazards and monitor for dangerous wildlife.

1.1.15 Response Procedure

Immediate Actions:

i. **Assess the Situation:**
   - Determine the nature and severity of the medical emergency.
   - Check responsiveness and vital signs (breathing, pulse).

ii. **Provide First Aid:**
   - Administer appropriate first aid based on the condition.
   - Use CPR if necessary and trained to do so.

iii. **Call for Help:**
   - Contact local medical services immediately, providing clear information about the patient's condition.

iv. **Comfort and Monitor:**
   - Keep the patient comfortable and monitor their condition until help arrives.
   - Avoid giving food or drink if not appropriate for the condition.

v. **Prepare for Transport:**
   - Arrange safe and prompt transport to a medical facility if required.

vi. **Document the Incident**:

- Record details of the incident, response actions, and outcomes for future reference and improvement.

1.1.16 Equipment and Resources

- **Comprehensive First Aid Kits**: Including supplies for various medical situations.
- **Emergency Contact List**: Up-to-date numbers for local clinics, hospitals, and emergency services.
- **Transportation Means**: Reliable vehicles available for quick transport to medical facilities.
- **Trained First Aiders**: Personnel trained in basic and advanced first aid techniques.

COMMUNICATION PLAN

Effective communication is vital during emergencies to ensure timely and coordinated responses.

1.1.17 Internal Communication

i. Methods:

- Verbal Alerts: Shouting specific alarms (e.g., "FIRE!", "EVACUATE!") for immediate attention.
- Whistles/Horns: Using distinctive sounds to signal different types of emergencies.
- Mobile Phones/Two-Way Radios: For detailed communication among ERT members and personnel.

vii. Procedures:

- Emergency Coordinator disseminates information and instructions during emergencies.
- Communication Officer maintains open lines and updates all relevant parties.

1.1.18 External Communication

- **Emergency Services**
  - Fire Department: (Phone numbers to be included)
  - Medical Services: (Phone numbers to be included)
  - Police/Security: (Phone numbers to be included)
- **Local Community Leaders:**
  - Inform nearby communities when emergencies may impact them.
- **Media and Public Relations:**
  - Designate a spokesperson to handle inquiries and provide accurate information.

1.1.19 Communication Equipment

- **Mobile Phones**: Ensure all ERT members have charged and functional phones.

- **Two-Way Radios**: Available for reliable on-site communication where mobile coverage is poor.
- **Emergency Contact Lists**: Posted prominently and carried by key personnel.

TRAINING AND DRILLS

Regular training and drills are essential to ensure preparedness and effective response during actual emergencies.

1.1.20 Training Programs

Frequency: Conduct training sessions at least twice a year.

Content:

- **Emergency Procedures**: Detailed walkthroughs of response steps for various scenarios.
- **Use of Equipment**: Hands-on training on firefighting equipment, first aid kits, and communication devices.
- **Hazard Recognition**: Identifying and mitigating potential risks in daily operations.
- **Health and Safety Practices**: Proper use of PPE and safe working procedures.

1.1.21 Emergency Drills

- **Types of Drills:**
  - Fire Evacuation Drills: Practicing swift and orderly evacuation.
  - Rescue Drills: Simulating responses to pit collapses and machinery accidents.
  - Medical Emergency Drills: Responding to sudden health incidents and injuries.

- **Evaluation:**

  - **Post-Drill Reviews**: Assess performance, identify gaps, and discuss improvements.
  - **Feedback Collection**: Encourage participants to share experiences and suggestions.
  - **Action Plans**: Implement changes based on drill outcomes to enhance preparedness.

- **Record Keeping**

  - Maintain records of all training sessions and drills, including attendance, content covered, and evaluation results.

    - **RESOURCE MANAGEMENT**

Effective emergency response relies on the availability and proper maintenance of necessary resources.

1.1.22 Equipment Maintenance

- **Regular Inspections**: Check all emergency equipment monthly to ensure functionality.
- **Servicing and Repairs**: Address any faults or damages promptly.
- **Inventory Management**: Keep an updated list of all equipment and supplies; replenish as needed.

1.1.23 8.2. Resource Accessibility

- **Strategic Placement**: Position equipment and supplies in easily accessible and clearly marked locations.
- **Visibility**: Use signs and labels to indicate the location of emergency resources.

POST-EMERGENCY ACTIONS

Proper steps after an emergency are crucial for recovery and future preparedness.

1.1.24 Incident Assessment

- Investigation: Conduct thorough investigations to determine causes and evaluate response effectiveness.
- Reporting: Prepare detailed reports documenting the incident, responses, and outcomes.

1.1.25 Recovery and Restoration

- Damage Assessment: Evaluate and document damages to property and environment.
- Restoration Plans: Develop and implement plans to repair and restore affected areas and resume normal operations.
- Support for Affected Individuals: Provide medical, psychological, and financial support as needed.

1.1.26 Plan Review and Update

- Learning from Experience: Use insights from the incident to update and improve the EPRP.
- Stakeholder Involvement: Engage all relevant parties in reviewing and revising emergency procedures.
- Regular Updates: Review and revise the EPRP annually or after any significant incident.

CONCLUSION

This Emergency Preparedness and Response Plan provides a comprehensive framework tailored to the specific needs and conditions of Artisanal Small-Scale Gold Mining operations. Effective implementation requires commitment from all personnel, regular training, and continuous improvement to ensure safety and resilience in the face of emergencies.

11 Institutional Arrangement and Reporting

The administrative framework for environmental management both at national and at the mine site is included in Section 5.3.