ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF GOLD ORES PROCESSING AND WASHING FACILITIES IN SAMBARU VILLAGE, MANG'ONYI WARD, IKUNGI DISTRICT IN SINGIDA REGION

ENVIRONMENTAL IMPACT STATEMENT

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DECLARATION

I declare the following:

- The undersigned have conducted the study professionally using acceptable methodologies.
- The study findings are correct to the best of my knowledge and have not been altered in any manner.
- The mitigating measures proposed (whenever relevant) to the best of my knowledge are reliable, practical, and adequate to comply with the relevant legal requirements; and
- Eng. Anael Macha will be accountable for any misleading information in any part of this report

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ABBREVIATIONS AND MEANINGS

AFWIMM	Africa Forum on Women in Mining and Minerals
AIDS	Acquire Immune Deficiency Syndrome
ARI	Acute Respiratory Infections
As	Arsenic
ASGM	Artisanal and Small-scale Gold Miners
ASM	Artisanal and Small-scale Miners
BWB	Basin Water Board
Ca	Calcium
CBOs	Community-Based Organizations
Cd	Cadmium
CECL	City Engineering Company Limited
Cl	Chlorine
Cr	Chromium
CRDB	Cooperative Rural Development Bank
Cu	Copper
dBA	decibels
DC	District Council
DED	District Executive Directors
DEM	Digital Elevation Model
DEMO	District Environment Management Officer
DMO	District Medical Officer
DPLO	District Planning and Land Officer
E&S	Environmental and Social
EA	Environmental Audit
EHPMP	Environmental Health and Pollution Management Project
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMA	Environment Management Act
EPP	Environmental Protection Plan
ESCBA	Environmental and Social Cost Benefit Analysis
ESCP	Environmental and Social Commitment Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standards
FDI	Foreign Direct Investment
Fe	Iron
FGD	Focus Group Discussions
GBV	Gender-Based Violence
GCLA	Government Chemist Laboratory Authority
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GEF	Global Environmental Facility
GIS	Geographic Information System

GOP	Gold Ores Project
GoT	Government of Tanzania
GPS	Global Position System
GRM	5Grievance Redress Mechanism
Hg	Mercury
HIV	Human Immunodeficiency Virus
HSE	Health and Safety Expert
ICGLR	International Conference of the Great Lakes Region
IDB	Internal Drainage Basin
IIED	International Institute for Environment and Development
K	Potassium
LC	Least Concern
LGAs	Local Government Authorities
LMP	Labor Management Plan
LSM	Large-Scale Mining
MC	Municipal Council
Mg	Magnesium
MOI	Medical Officer In charge
MRO	Mines Resident Officer
Na	Sodium
NEMC	National Environment Management Council
NEP	National Environmental Policy
NGOs	Non-Governmental Organizations
Ni	Nickel
NMB	National Microfinance Bank
OECD	Organization for Economic Co-operation and Development
OHS	Occupational Health and Safety
OSHA	Occupational Safety and Health Authority
Pb	Lead
PDF	Portable Document Format
PIT	Project Implementation Team
PML	Primary Mining License
PPE	Personal Protective Equipment
RAS	Regional Administrative Secretary
RC	Regional Commissioner
RE	Revised
REA	Rural Electrification Agency
RFO	Regional Fire Officer
RINR	Regional Initiative against the Illegal Exploitation of Natural Resources
RMO	Regional Medical Officer
RMO	Resident Mines Officer
ROM	Run of Mine
RPC	Regional Police Commander
Sb	Antimony
SEA	Strategic Environmental Assessment

SEP	Stakeholder Engagement Plan
SO4	Sulphate
SWAT	Soil and Water Assessment Tool
TANESCO	Tanzania Electric Supply Company Limited
TAWOMA	Tanzania Women Miners Association
TFS	Tanzania Forest Service Agency
ToR	Term of Reference
TTCL	Tanzania Telecommunication Company
TV	Television
UN	United Nation
URT	United Republic of Tanzania
UTI	Urinary Tract Infections
VAC	Violence Against Children
VC	Village Councils
VEO	Village Executive Officers
VPO	Vice President Office
WAEO	Ward Executive Officer
WB	World Bank
WCDO	Ward Council Development Officer
WDC	Ward Development Committee
WEO	Ward Executive Officer
Zn	Zinc

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^0C	degrees Celsius
cm	Centimetre
dBA	A-weighted decibel
g	gram
kg	Kilogram
km	Kilometre
Km^2	Kilometre square
m	meter
mg/L	Milligram per Liter
mg/Nm^3	Milligrams per cubic metre
mm	Millimetre
mm/s	Millimetres per second

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INTRODUCTION

The Tanzania Environmental Health and Pollution Management Project (EHPMP) have 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).

The National Environmental Management Council (NEMC) is the Project Institution for this project intends to construct Mercury mineral processing centers equipped with Personal Protective Equipment (PPE) to be used as demonstration centers 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 Shinyanga and Singida Regions.

PROJECT DESCRIPTION

The proposed gold ore processing facility is located in Sambaru Village, Mang'onyi Ward, Ikungi District, Singida Region, Tanzania, at coordinates 05°18'24.9"S, 35°02'21.6"E. The site, owned by Marwa Marwa and partners, is accessed via a 35 km drive south from Singida Town on the Dar to Mwanza highway, followed by 42 km on a gravel road. The facility will utilize a 100m x 70m piece of land covered with miombo and acacia woodland, previously cleared for shallow pit mining. Adjacent areas include natural woodland, residential zones, and other mining sites. This location aligns with the exclusion criteria for project siting, avoiding areas with high environmental sensitivity, significant biodiversity, or land disputes. The project is designed to operate within the provisions of Tanzania's environmental and mining regulations, ensuring minimal environmental disturbance and sustainability.

Gold extraction at the site employs a conventional process, including crushing, milling, sluicing, amalgamation, and open burning, with VAT leaching performed offsite. Current operations produce an average of 4 tonnes of gold ore daily, with 22 active pits and six temporarily closed. The proposed project will modernize and optimize these operations while adhering to safety and environmental standards. Essential utilities, such as water trucking and energy generation, will support the project amidst local infrastructure challenges. Waste management strategies, including dust suppression, controlled tailings disposal, and mercury management, will ensure compliance with environmental guidelines and reduce health risks. Through its phased development and stakeholder engagement, the project aims to enhance local economic benefits while preserving the surrounding environment.

LEGAL REQUIREMENTS

Chapter Three of this report presents an overview of the administrative, institutional, and legal frameworks relevant to the proposed construction of Gold Ore Processing and Washing Facilities at the Marwa Marwa and Partners Site. The chapter outlines the role of various institutions, including the National Environment Management Council (NEMC) and the Ministry of Minerals, in ensuring compliance with standards including the Environmental Management Act of 2004, and emphasizes the importance of enhancing institutional capacities to mitigate the health risks associated with mercury use in Artisanal and Small-scale Gold Mining (ASGM). Furthermore, it highlights the intertwined relationship between environmental protection and community well-being, laying the groundwork for sustainable mining practices guided by national policies and regulations.

The legal and institutional frameworks delineated in this chapter serve as crucial guidelines for stakeholders involved in the mining sector, particularly regarding adherence to environmental standards and the promotion of social responsibility. Key legislation, such as the Mining Act of 2010 and the Environmental Management Act, of 2004 connect regulatory requirements to practical operational measures within ASGM sites, ensuring that mining activities are economically viable and environmentally sound. By recognizing regional and international standards, along with the engagement strategies outlined by the World Bank's Environmental and Social Standards, the chapter underlines the importance of a holistic approach to mining that incorporates stakeholder participation, creating tangible benefits for both the environment and local communities.

ENVIRONMENTAL AND SOCIAL BASELINE

The biological environment study conducted encompasses the wildlife and vegetation present in the study area and its surroundings. This study was carried out using onsite surveys, interviews with locals, Focus Group Discussions, Opportunistic Sampling, and document reviews. Data from secondary sources indicates that about 70% of the Ikungi district is covered by forests, woodland, thickets, and grassland. In Sambaru village, common alien plants such as *Senna siamea* (known locally as Mjohoro) and *Mangifera indica* (Mango Tree) are found. Additionally, a few fauna species, including the Vervet monkey and olive baboon, were opportunistically observed and reported on the project site.

The average minimum temperature in Ikungi ranges from 13°C to 29°C. The region experiences one high maximum rainfall, with the rainy season lasting from October to May and the dry season from June to September, with little to no precipitation. Singida's evaporation rate exceeds precipitation, particularly during the dry season when there is no rainfall, resulting in high evaporation rates.

The baseline study also assessed hydrology, surface water resources, and groundwater resources to determine water quality, quantity, and groundwater flow.

In terms of socio-economic aspects, the baseline study covered Ikungi district and the local area (Mang'onyi ward). The main socio-economic activities in the area include agriculture, livestock keeping, mining, and small businesses.

STAKEHOLDER CONSULTATIONS

This chapter emphasizes the role of stakeholder consultation in fostering positive relationships and effective communication throughout the project lifecycle. The chapter outlines a structured approach to engaging with various stakeholders, including local communities, government agencies, and affected parties, to identify their concerns and incorporate their feedback into the project planning and implementation processes. The engagement process was framed by World Bank Environmental and Social Standards (WB ESS 10), aiming to enhance project acceptance, address environmental and social impacts, and ensure that stakeholders have accessible means to voice their opinions and grievances. A Stakeholder Engagement Plan (SEP) was developed to facilitate meaningful consultations, ensuring that the interests and perspectives of all stakeholders, particularly those directly affected by the gold ore processing and washing facilities project, are effectively integrated into the Environmental and Social Management Plan (ESMP).

The chapter further discusses the legislative requirements guiding the stakeholder engagement process, aligning with both Tanzanian laws and international standards. Through a combination of public meetings, focus group discussions, and one-on-one consultations, stakeholders expressed a range of opinions regarding the potential impacts of the project, highlighting both benefits and concerns. Key feedback from stakeholders emphasizes the necessity for enhanced safety measures, education on mercury handling, and the importance of ongoing collaboration with local communities. Moreover, the Grievance Redress Mechanism (GRM) is presented as an essential tool for addressing complaints and fostering transparency and accountability. By establishing this mechanism, the project aims to empower local communities to voice their concerns regarding potential socio-environmental impacts, thereby promoting inclusivity and enhancing the overall success of the gold ore processing and washing facilities project.

ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS IDENTIFICATION AND ASSESSMENT

The potential impacts identified are based on project activities, stakeholder consultation, and different studies conducted in this ESIA study. Among the impacts identified are:

- Hazardous waste management (including disposal) at pilot sites;
- Dust and particulate materials, causing nuisances to surrounding families and businesses, especially 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.

The mitigation measures proposed to reduce or solve the above impacts in the ESMP are responsible for providing resources to ensure all impacts are managed to comply. There will be an HSE Manager who will oversee the implementation and compliance of the ESMP.

The estimated cost will be available to implement the ESMP. Impacts will be managed according to project phases which are the mobilization phase, construction phase, operational phase, and decommissioning.

IMPACTS MITIGATION AND ENHANCEMENT MEASURES

This chapter elaborates on identified potential impacts associated with the construction and operational phases of the gold ore processing and washing facilities project, along with mitigation measures. The analysis indicates that many of these impacts can be effectively mitigated through previously established, tested, and approved methods, often codified in legislation and best practice guidelines. Proposed measures during the construction phase focus primarily on health and safety for both workers and the surrounding community, addressing issues such as dust generation, accident prevention, waste management, and the promotion of employee hygiene. Specific strategies include the provision of personal protective equipment (PPE), training sessions for workers, implementation of a waste management program, and adherence to safety protocols to minimize risks and enhance overall project safety.

The operational phase highlights additional risks related to the use of hazardous materials, particularly mercury and other chemicals. Proposed solutions include mitigating harmful exposure through improved extraction techniques, promoting efficient processing methods,

and ensuring access to alternative, non-hazardous materials that can support operational efficiency without compromising health and safety. Furthermore, a focus on community engagement and employment practices emphasizes the importance of local hiring, fair labor terms, and avoiding child labor, thus fostering a more sustainable and socially responsible project environment.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) serves as a framework for managing the social and environmental impacts and risks associated with the project throughout its lifecycle. The plan outlines specific mitigation measures, demonstrates the organizational capacity to implement them, and confirms compliance with relevant laws and regulations, all to minimize negative impacts while enhancing project benefits. The Environmental and Social Management Plan will be the responsibility of the project implementer, the National Environmental Management Council (NEMC), in cooperation with the Mine Commission. The actions, responsibilities, and associated costs for each project phase are presented in Table 8.1, which highlights key potential impacts and the corresponding mitigation strategies designed to address them.

The ESMP encompasses a series of activities, from construction to operations and decommissioning, ensuring that environmental and social risks such as dust generation during construction, health and safety concerns among employees, and waste management issues are addressed. Each phase includes proposed mitigations, designated responsibilities, targets, and estimated costs, showcasing the commitment to sustainable practices within the project. For instance, during construction, measures like providing personal protective equipment (PPE), conducting training, and implementing waste management programs aim to ensure the health and safety of all workers. In the operational phase, activities will focus on minimizing noise, managing hazardous substances, and promoting proper waste disposal.

ENVIRONMENTAL AND SOCIAL MONITORING PLAN

The Environmental and Social Monitoring Plan is designed to evaluate the effectiveness of the mitigation and management measures implemented in the Environmental and Social Management Plan (ESMP). This monitoring system aims to promptly identify deviations from established standards, enabling timely adjustments to mitigation strategies and the detection of any adverse environmental changes resulting from project operations. The Health, Safety, and Environment (HSE) Manager will oversee monitoring activities, collaborating with different departments to ensure compliance with the monitoring plan. Marwa Marwa and Partners will develop tailored monitoring procedures that adhere to both local and international standards, clearly outlining the parameters to be monitored, the frequency of monitoring, and the responsibilities of various stakeholders.

The monitoring program will focus on critical aspects of the physical, biological, and social environment, including water quality and quantity, health and safety data, waste management, noise, and air quality. On-site sampling will be conducted by an HSE expert, with samples analyzed at accredited laboratories according to environmental standards established under the Environmental Management Act of 2004. The total estimated annual budget for implementing this Environmental Monitoring Plan is TShs 10,500,000, which encompasses ongoing assessments to ensure compliance with permissible limits in various environmental parameters. Table 9-1 in the report outlines the specific monitoring plan,

detailing potential impacts, parameters monitored, frequency, locations, and associated costs. This systematic approach ensures that the project minimizes adverse environmental effects while promoting safety and sustainability throughout its lifecycle.

EMERGENCY PREPAREDNESS AND RESPONSE PLAN FOR SAMBARU SINGIDA

Chapter Ten presents the Emergency Preparedness and Response Plan (EPRP) for Artisanal Small-Scale Gold Mining (ASGM) operations in the Sambaru Singida area, addressing the hazards and emergency scenarios inherent in this sector. The EPRP establishes guidelines to safeguard the health and safety of personnel and communities, outlining procedures and responsibilities for a range of emergencies, including fire outbreaks, pit wall collapses, mercury exposure, machinery accidents, and medical emergencies. Key objectives focus on protecting human life, minimizing environmental impacts, reducing property damage, ensuring efficient emergency response, and promoting preparedness through training and drills. A dedicated Emergency Response Team (ERT) is tasked with coordinating actions, and the plan emphasizes the importance of efficient communication, regular equipment maintenance, and post-emergency assessments to enhance overall safety and resilience in the event of an incident. The successful implementation of this plan requires a commitment from all stakeholders and continuous improvement in emergency response efforts.

COST-BENEFIT ANALYSIS

When evaluating the project's tangible and intangible costs alongside its built-in mitigation measures and benefits, it becomes evident that continuing operations at the Marwa Marwa and Partners site will outweigh the costs and bring more benefits to the local communities, environment, and the nation.

DECOMMISSIONING PLAN

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.

SUMMARY AND CONCLUSION

This chapter summarizes the report of the Gold Ore Processing and Washing Facility project in Sambaru village, Singida Region, highlighting its significant socio-economic benefits to local communities and the broader region. The study was conducted to assess the potential environmental and social impacts, and these impacts have been determined to be manageable through an Environmental and Social Management Plan (ESMP) and Monitoring Plan. The project is designed to align with national environmental regulations and best practices, ensuring that it operates sustainably. The National Environment Management

Council (NEMC) is committed to overseeing the project's implementation. Generally, the conclusion recommends that the project proceed as planned, as it will provide valuable benefits while effectively managing any identified impacts.

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1 CHAPTER ONE:

1.1 INTRODUCTION

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 the 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 centers equipped with personal protective equipment (PPE) for best environmental practices. These facilities will be used as demonstration centers 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 in collaboration with the Mining Commission intends to construct Mercury mineral processing centers equipped with Personal Protective Equipment (PPE) to be used as demonstration centers 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 Shinyanga and Singida Regions.

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 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 contributed 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 the use of mercury due to its affordability, and ease of use (it is not needed and as it has been used for many years ASGM is 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 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 childbearing age (potentially pregnant), and breast-feeding women, work or live in ASGM communities and are at risk of mercury exposure.

The major exposure of mercury in the ASGM communities occurs during the amalgamation process as it is undertaken without wearing appropriate Personal Protective Equipment (PPEs) with bare hands (Figure 1-2) and no respiratory protection or encasing of fumes during open burning of the amalgam to remove the mercury and remain with the pure gold. The 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 literature indicates 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 contains 40-60% mercury. The report also indicated that ASGM is the most affected subsector, where about 1.5 million people were estimated to be at mercury exposure risk, of which 20-30% were women including about 75,000 children .

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 ESIA OBJECTIVES

The main objective of this study is to undertake an exercise for the development of ASGM gold processing and washing facilities for two main aims:

i. To obtain an EIA certificate by the Environmental Impact Assessment and Audit Regulations of 2005 as Amended in 2018

ii. 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 that 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 the proposed mitigation measures

The ESIA process and subsequent EIS documentation were undertaken in accordance with the requirements of the EMA and the Environmental Impact Assessment and Audit Regulations, 2005 and the Environmental Impact Assessment and Audit (Amendment) Regulations, 2018.

1.4 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 delineating catchments and defining streams; Excel for data analysis and Word for reporting were also applied; and field studies for collecting biophysical and socio-economic information.

1.4.1 Document Review

Several documents will be revised to obtain information about 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 impact; 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.

1.4.2 Field Visits

The project team has undertaken a site visit for firsthand information on the site and surrounding environmental 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, and soil quality as this activity was already undertaken by the PIT during site selection and preparatory works and was 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.

1.4.3 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 the disclosure of project information and the 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 ensure that engagement is free, prior, and informed then the team will send notification (Official letters, notices, electronic mail, or via phone) with the 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 levels; 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.

1.4.4 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, and fishermen will be undertaken. GPS coordinates and photographs will be taken for reference once back in the office and for inclusion in the study.

1.4.5 Impact Identification and Assessment

Some of the potential impacts of this project as narrated in section 3.1 of the ESMF were 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 significant 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.

1.4.6 Mitigation, ESMP, and Monitoring

Statutory requirements (particularly the EIA and Audit Regulations of 2005 as Amended in 2018, Mining (Environmental Protection for Small Scale Miners Regulations of 2010, Industrial and Consumer Chemicals (Management and Control) Regulations of 2020), WB ESMF, best practices and guidelines for similar projects and context will be the main criteria used to

proposed 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 of the proposal project. The ESMP chapter will be presented in accordance with Annex IV of the ESMF however, as already 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.

1.5 SCOPE OF THE PROJECT

The scope of this study is as guided by the Environmental Impact Assessment and Audit Regulations of 2005 and its Amendment of 2018 and the terms of reference (ToR) and scoping report that were approved by NEMC on 05th April 2024 via screening decision letter with reference number HD./145/205/28/02. The ToR approval letter from NEMC is appended in Appendix II of this report.

1.5.1 Spatial Boundaries

The spatial boundaries cover the geographical spread of the impacts regardless of whether they are short-term or long-term. The spatial scale considers the receptor environmental component and can be local or broader. Two zones of impact namely the core impact zone and the influence impact zone were considered.

- The core impact zone: The core impact zone includes the areas immediately bordering the project area. In this case, this project will include the site where the Gold ore processed and washing facilities will be built and the immediate physical environment that the project may impact.

- The influence impact zone: This encompasses the area beyond the anticipated project area that may be positively or negatively impacted by the project, i.e., economic losses/benefits and resources that may result from the project operation.

1.5.2 Temporal Boundaries

The project will be divided into four phases: the mobilization, construction, operation, and decommissioning phases, as illustrated in section 2.5.

1.5.3 Institutional Boundaries

Institutional boundaries in this context pertain to the institutions and sectoral boundaries within which the project is situated or mandated. The project involves the construction of gold ore processing and washing facilities to be used as demonstration centers by ASGM around the proposed site. The relevant institutions and administrative units of interest in Tanzania are listed below.

Institutions (Regulatory and Service Organizations)

- Ministry of Water
- Zonal NEMC Office – central zone
- Inland Basin Water Board
- Government Chemistry Laboratory Agency (GCLA)
- Fire and Rescue Offices
- Occupational Safety and Health Authority (OSHA) Central Zone

Administrative Units

- Mining Commissioner
- Regional Commissioner
- Singida Regional Office
- Iramba Municipal Council
- Resident Mines Officer (RMO) Office
- Mang'onyi Ward
- Sambaru Village Council
- Marwa Marwa and Partners (Private Mining Company)

These institutions have been consulted, as they are key stakeholders with a vested interest in the safe development and operation of this project

1.6 SCOPING TERMS OF REFERENCE

The terms of reference cover the 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 Labor and Working Conditions
- ESS 3: Resource Efficiency and Pollution Prevention
- ESS 4: Community Health and Safety
- ESS 10: Stakeholder Engagement and Information Disclosure

1.7 PRELIMINARY STUDIES

NEMC conducted environmental baseline studies for the sites and collected data about air, soil, water, and noise quality. Furthermore, some stakeholder engagement relevant to 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).

1.8 STRUCTURE OF THE REPORT

This report is structured according to the requirements under the EIA and Audit Regulations of 2005, it contains the following chapters:

- **Chapter One:** contains the introduction on the background information of the proposed project, its rationale, and the proposed project implementation arrangements.
- **Chapter Two:** contains the project description, in which there is a description of the location and relevant components of the project and their activities.
- **Chapter Three:** illustrates policy, legal, and administrative framework, which are the relevant Tanzanian environmental policies and legislation applicable to the existing projects including WB ESS and General EHS Guidelines.
- **Chapter Four:** describes the area of influence and relevant physical, biological, and socioeconomic conditions, including any changes anticipated before the project commences.
- **Chapter Five:** expresses the consultation exercise at the project area detailing the list of stakeholders consulted and the issues raised Stakeholder engagement plan, Grievance Redress System

- **Chapter Six:** describes the environmental impact assessment and identification of 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 positive environmental and social outcomes as well. of Alternatives.
- **Chapter Seven:** describes mitigation measures for the potential negative impacts. 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 responsible authority.
- **Chapter Eight:** presents the Environmental and Social Management Plan (ESMP). Identifies key measures and actions and the timeframe required for the project to meet the requirements of the ESSs. This will be used in developing the Environmental and Social Management Plan (ESMP).
- **Chapter Nine:** presents the Environmental Monitoring Plan that contains the proposed institutions to carry out the monitoring activities, the monitoring indicators, the time frame, and the proposed budget for monitoring.
- **Chapter Ten:** gives the cost-benefit analysis of the project.
- **Chapter Eleven:** provides the conceptual decommissioning plan for the proposed project.
- **Chapter Twelve** gives the summary and conclusion of the assessment.

ANNEXES

- List of the individuals or organizations that prepared or contributed to the environmental and social assessment.
- References—setting out the written materials both published and unpublished, that have been used.
- Records of meetings, consultations, and surveys with stakeholders, including those with affected people and other interested parties.

2 CHAPTER TWO: PROJECT DESCRIPTION

2.1 PROJECT LOCATION AND ACCESSIBILITY.

The mining site is administratively located at Sambaru Village, Mang'onyi Ward in Ikungi district, Singida Region at coordinates (05018'24.9'S, 35002'21.6' E).

The site can be accessed by driving about 35 km south from Singida Town on the Dar to Mwanza tarmac highway, branching off at Ikungi Centre, and then driving about 42 km on an all-weather gravel road to where the proposed site is located. It is about 7 km away from the Sambaru village center.

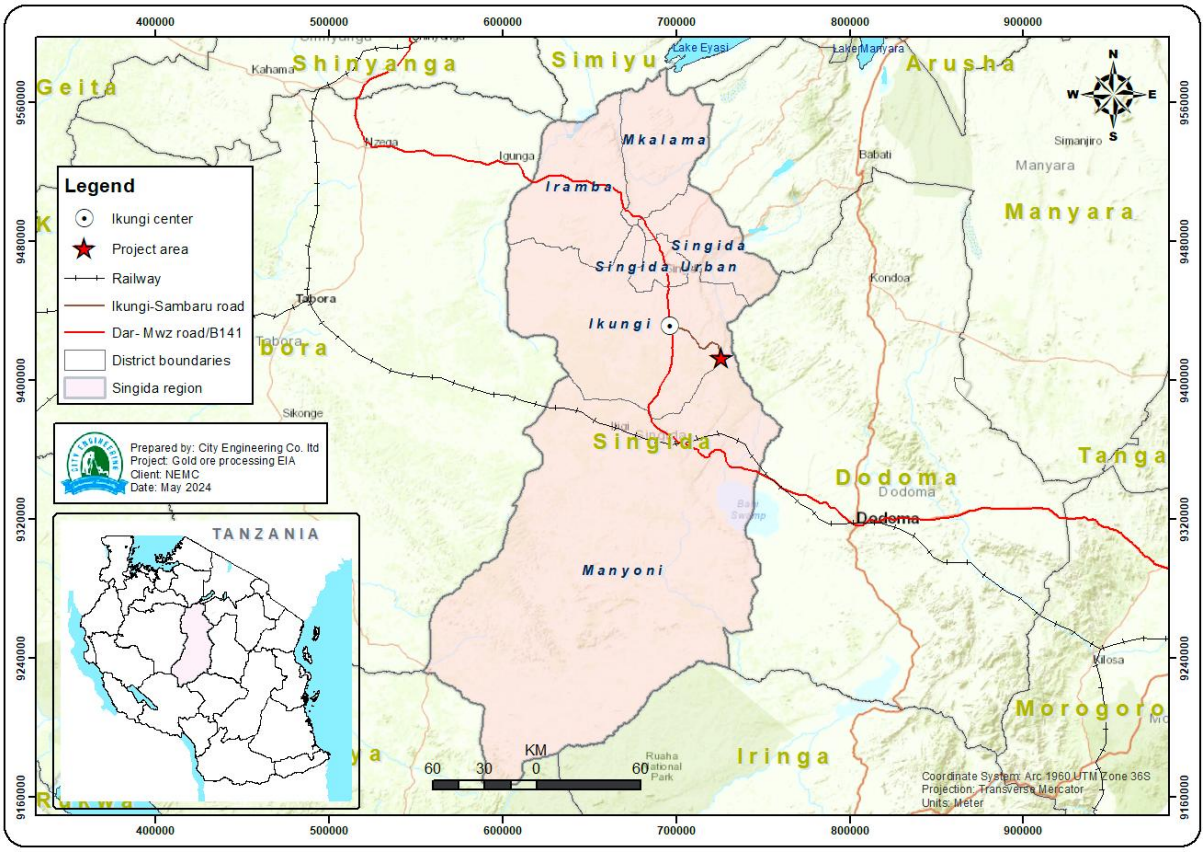


Figure 2-1: Project Location Map
Source: City Engineering Company Limited

2.2 LAND OWNERSHIP, LAND USE, AND LAND ACQUISITION

2.2.1 Land ownership and Land use

The project area for the construction of the Gold Ores Facility is owned by Marwa Marwa and partners and is within PML No. 0006953CZ for gold mining and processing as indicated in appendix. It is within miombo and acacia woodland as there were many mature trees left standing with underbrush consisting of grass which is largely not cleared but withers away from being stepped, especially around mineshafts. The site representative informed the team that the area provided is about 100m long and 70m wide and that there is room for expansion. The

area is rocky, and an access road needs to be created. The representative showed the optional route from the existing track nearby, which will avoid the dwellings.

However, the specific site consists of previously cleared land that was formerly used for surface and shallow pit mining. It is bordered by residential houses and processing facilities on two sides while the remaining is natural woodland

The land is for mining activities, of which the mining method employed is underground mining methods with a total of 28 mining pits (Maduara), where twenty-two (22) mining pits are active and are working to produce gold ore, and six (6) are temporarily closed (not active). The underground mine pits developed have a maximum mining depth of 84 m. The average daily mining production rate is 4 tonnes of gold ore, equivalent to 50 bags of 80kg each.

2.2.2 Adjacent Land

Adjacent to these PMLs there are other mining sites (primary mining licenses) owned by Elizabeth Shango, Yusufu Mwandami and Ushirika were Waamimika at the North, East, and Northwest sides, respectively. The specific site consists of previously cleared land that was formerly used for surface and shallow pit mining It is bordered by residential houses and processing facilities on two sides while the remaining is natural woodland.

Figure 2-2: Proposed project site

Source: Site Visit

2.2.3 Land acquisition and Site Selection

The project screened the project site following the exclusion criteria that the project sites will NOT:

- 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 traditionally owned or under customary use or occupation or have a collective attachment to indigenous and vulnerable people as defined in ess7.
- 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 in locations where forced or child labor is present.
- Be close to a riparian zone.
- Have a high ground water table;
- Inaccessible by road
- Where land is required, the sites should have a legally established landowner willing to voluntarily allow the siting of the demonstration pilot on their land in line with the requirements of ESS 5 on voluntary land donation or be government-owned land (without resulting in displacement)
- The site for locating the demonstration pilot will be selected in consultation with the stakeholders and will be one that is easily accessible to 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, the 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.

2.2.4 Declaration of the Project Area

The project 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 areas as per Mining Act 2010). If a site did not meet the key criteria, it was not considered further for project implementation

2.3 CURRENT STATUS OF GOLD PROCESSING OPERATIONS

The conventional crush-mill-extract process in ASGM operations is illustrated in Figure 2.4, with VAT leaching of tailings occurring offsite. All crushers, gold processing, and washing bay facilities are within the Primary Mining License (PML). For the current ore processing and gold recovery process, only the infrastructure footprints, such as crushing/grinding, washing, amalgamation pools, and ore and tailing storage, operated by society members, are cleared. Below is a detailed description of each stage:

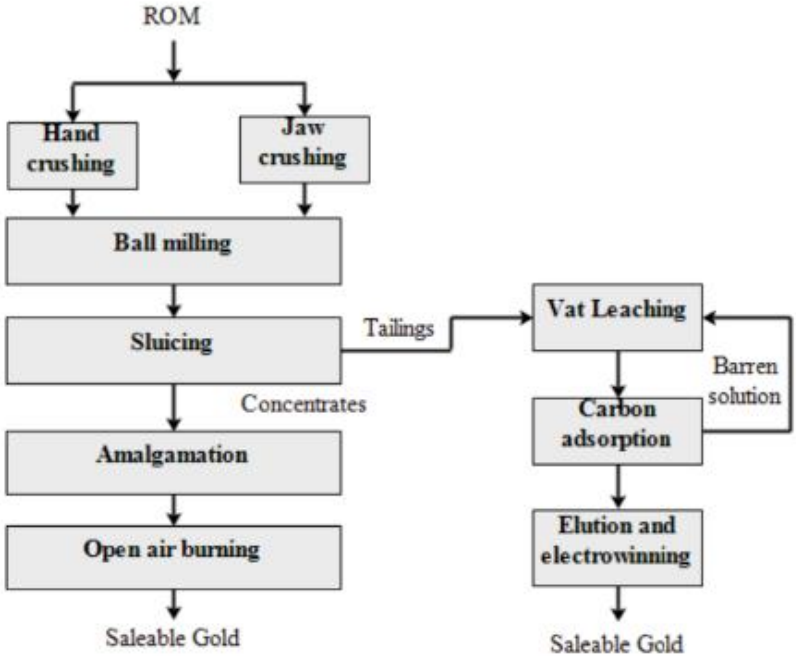


Figure 2-3: Current Gold Ores Processing Flowsheet at ASGM Sites

Source: Site Visit

2.3.1 Comminution Process

At comminution crushing (hand crushing, and jaw crushing) and grinding are processed.

2.3.1.1 Crushing

The extracted ore is broken down into smaller particles to facilitate further processing. Manual crushing using sledgehammers is the primary method, providing employment opportunities for local villagers. This is done by using simple tools such as hammers for the purpose of breaking down the ore into small pieces (20.0 cm) enough to be processed into a jaw crusher.

2.3.1.2 Grinding

After crushing, the ore is further reduced to fine particles using a **wet ball mill** to minimize dust and noise pollution. The site is designed to accommodate at least two ball mills, each with a processing capacity of **200 kg/hour**.

2.3.2 Gravity Concentration

The ground ore is mixed with water to create a slurry, which is then processed using **sluice tables** for gold concentration. The site is planned to have four sluice tables designed to enhance gold recovery efficiency.

2.3.3 Water Management System

2.3.3.1 Settling Ponds

The proposed site is designed to have two ponds which play a crucial role in reducing water pollution and maintaining process water quality:

- **Settling Pond 1**: Designed to capture and treat runoff water containing suspended particles before reuse.
- **Settling Pond 2**: Receives overflow from the first pond, allowing finer sediment to settle before water is pumped for recycling.

2.3.4 Tailing

A **tailing storage area** is designated for the disposal of processed materials, ensuring environmental protection and compliance with best practices.

2.3.5 Water Supply and Storage

A **5,000-liter water storage tank** is included to meet operational water needs. Water is sourced and stored to support the grinding, concentration, and sluicing processes.

2.3.6 Mercury Management and Amalgamation

In the amalgamation stage, Wet gold concentrates are mixed with liquid mercury and panned for several minutes to produce gold amalgam which is formed after mercury binds to the gold. The remain mercury is then squeezed out, through a cloth, and reused.

2.3.6.1 Amalgamation Pond

A designated pond is provided for mercury-based gold extraction, aiming to contain and manage mercury contamination.

2.3.6.2 Mercury Contaminated Water Treatment

A phytoremediation system using **water lettuce (Pistia stratiotes)** is planned for treating mercury-contaminated water, with an estimated removal efficiency of **30-70% mercury**.

2.3.7 Gold Refining

A **retort system** is included to recover mercury during gold purification. The retort is a closed system that condenses mercury vapours, minimizing emissions and health risks.

2.4 PROPOSED FACILITIES/COMPONENTS

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 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 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 been contaminated primarily by mercury 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 of ore processing.
Collection Water Pond	Stores clarified water from the 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 concentrate from 1–2 tph of 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	An estimated 1–2 kg of amalgam per hour.

Component	Function	Size / Specifications	Capacity / Throughput
Water Storage Tank	Holds clean water supply for entire washing and processing circuit.	Capacity: 3,000 liters	Supports continuous 1–2 tph operation.
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	

Appendix IV: approved site layout plan and architectural drawings present the proposed facilities for gold ore processing. The design will include the following components: -

- Comminution process
- Gravity concentration
- Water management systems
- Tailing management
- Water supply and management
- Mercury management and amalgamation
- Gold refining
- Infrastructure and Utilities (shades, sanitation facilities, a pit latrine and soak pit system, storage for hazardous materials, and power supply; TANESCO grid, solar panels and generators as backup options)

[1]AGC Practical-Guide-on-Reducing-Mercury-in-ASGM en.pdf (artisanal gold. org) (PDF) Situational Analysis of Gold Processing Practices at Artisanal and Small-Scale Gold Mining in Tanzania (researchgate.net) Guide.pdf (unep.org)

2.5 PROJECT PHASE AND ACTIVITIES

The proposed project is structured into several phases, each containing a unique set of activities essential for successful implementation. These phases serve as the blueprint for navigating the project towards its intended outcomes.

2.5.1 Mobilization

This stage involves site investigations including environmental baseline studies conducted by the National Environmental Management Council (NEMC) to gather data on air, soil, water, and noise quality at various sites. Additionally, stakeholder engagement initiatives were undertaken, involving Regional Administrative Secretaries, Miners' Associations Leaders, Local Government Authorities spanning from village to district levels, PML Owners, Miners, and Resident Mines Officers (RMO). Subsequently, the Project Implementation Team (PIT) conducted a site selection exercise in July and August 2022. Sites provided by the Mining Commission are within active Artisanal and Small-Scale Gold Mining (ASGM) areas, including licensed sites under the Mining Act of 2010 (revised in 2019) and recognized Gold Rushes. Selection criteria comprised site activity levels, minimum miner thresholds, the presence of mining infrastructure, and historical operational profiles. This process ensures the identification of suitable sites for subsequent construction activities.

2.5.2 Construction phase

During this crucial stage, the construction of gold ore processing facilities entails a series of planned activities aimed at ensuring operational efficiency and environmental sustainability. Tasks include the establishment of foundational elements such as sluices, VAT leaching tanks, drainage, and amalgamation pools, vital for ore processing. Additionally, efforts are focused

[1]

on the rehabilitation of degraded land through strategic landscaping and tree-planting initiatives, promoting ecological balance. The deployment of heavy equipment is carefully expertly to streamline construction processes, this phase underscores a commitment to excellence, sustainability, and responsible resource management, laying the groundwork for future success.

2.5.3 Operational phase

In the operational phase of gold ore processing, a systematic series of activities is conducted to extract and refine precious metals with efficiency and precision. Initially, the process begins with ore drying to reduce moisture content and improve processing efficiency. Subsequently, hand hammer crushing is employed to break down the ore into smaller particles suitable for further processing. Following this, grinding and milling operations are carried out using crushers to achieve the desired particle size distribution necessary for effective extraction. A reliable power supply is essential to sustain these operations.

Once the ore reaches the desired particle size, sluicing techniques are used to separate gold particles from other minerals and impurities. This process requires careful monitoring and adjustment to optimize recovery rates while minimizing losses. Subsequently, the amalgamation process combines gold particles with mercury to form a gold amalgam. This amalgam undergoes a purification process to remove mercury and impurities through controlled heating, ensuring high-quality gold refinement.

Throughout these operations, adherence to industry standards and safety protocols is essential. Continuous monitoring and quality control measures are implemented to ensure product integrity and environmental compliance. The operational phase of gold ore processing represents a culmination of strategic planning, technological application, and skilled execution aimed at achieving efficient extraction and refining of gold.

2.5.4 Decommissioning Phase

This marks the conclusive stage of the proposed project, where two potential scenarios will be clarified: significant rehabilitation or enhancement of project structures, and the restoration of the project site to its original state. Activities encompassed within this phase entail the dismantling of redundant structures, demolition of existing infrastructure, and the careful management of resulting materials and operational areas. Throughout these processes, utmost consideration will be given to environmental, health, and safety standards, ensuring the well-being of personnel, the community, and the surrounding physical environment. A preliminary decommissioning plan will be devised to facilitate the comprehensive inventorying of all components scheduled for removal or disposal, thereby aiding in the formulation of the final decommissioning plan for approval.

2.6 PROJECT UTILITIES

2.6.1 Human Resources

Currently, the Marwa Marwa and Partners mine site has between 80 to 120 people involved in the operations daily. There is a designated operations manager and one HSE officer who oversees the daily operations. Most of the workers engaged do not have formal contracts and

are paid a day wage which is also attached to performance targets except the operations manager.

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

- 10 employees will be needed to construct each washing bay in each region
- 20 employees will be needed to construct the VAT Leaching Plants in each region
- 30 employees will be needed for the rehabilitation of degraded mining areas in each region (these will be used the same 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 the total labor requirement at the 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.

2.6.2 Water Sources

The area is very dry, even though the mine shafts are deep no groundwater has been encountered. The water used for gold ore processing operations is trucked to the site from mainly a drilled borehole owned by Mr. Abubakari Magoma, located more than 3 Km away, or a seasonal stream located about 5 km away which is only available during the rainy season. There is also a borehole at the Sambaru village center 10 km away.

2.6.3 Energy Source

In Sambaru village, the people are facing a shortage of electricity supply from the national grid. However, at the Marwa Marwa and Partners site, they use a small generator as the source of energy for their daily operations.

2.7 WASTE MANAGEMENT

2.7.1 Solid Waste

2.7.1.1 Domestic waste

Domestic waste at the mine sites are either disposed of on land or in shallow pits. The recovery of plastic water bottles is done as the team stated there is no market, but hard plastics from domestic activities and mine water supply and washing are traded. There is a scrap dealer (Figure 2-5) at the mining village purchases scrap metal and spent batteries, mainly sourced from the mining activities, and sells it to other dealers in Singida Town.

Figure 2-5: Scrap Dealer at the Mining Centre
Source: CECL Site Visit 2023

2.7.1.2 Waste Rock Management

During the site visit to the Marwa Marwa project, efforts in waste rock management were observed. The management strategies in place focus on minimizing environmental impacts associated with mining activities. Waste rocks were stored and segregated to prevent cross-contamination.

In addition, geochemical analysis is important for understanding the mineralogical composition of the waste materials and for assessing any risks they may pose to the environment. Findings are crucial to support informed decision-making regarding waste management practices.

2.7.2 Dust Emissions

Dust is primarily emitted during the ore size reduction stage in the crushing and milling process. To manage dust emissions onsite, water will be sprayed on the ore, particularly at the crusher's feed and discharge points, to reduce dust in the surrounding area. Workers will be provided with dust masks and protective clothing to minimize inhalation and skin contact. Additionally, the proposed design for the jaw crusher and milling equipment will include housing or enclosing these systems in structures to contain dust within a confined space. By implementing these measures, dust emissions can be effectively managed, protecting workers' health and reducing environmental impact.

2.7.3 Tailings

Tailings are generated during the gold separation stage, which involves the sluicing and amalgamation processes. Tailings will be stored in designated sedimentation chambers or tanks that are well-constructed and lined to prevent mercury and other metals from leaching into the soil and groundwater. Additionally, mercury will be properly contained and managed to prevent spillage into the air and soil, including the use of retorts to capture mercury vapors.

3 CHAPTER THREE: ADMINISTRATIVE INSTITUTIONAL AND LEGAL FRAMEWORK

3.1 INTRODUCTION

Mining operations involve various components, including processing and washing facilities, which are engineered structures designed to process gold ore and extract gold. The utilization of mercury in Artisanal and Small-scale Gold Mining (ASGM) has led to environmental health and pollution concerns in the surrounding mining areas and communities. In response, The Tanzania Environmental Health and Pollution Management Project (EHPMP) has initiated measures to mitigate the health risks associated with the unsafe use of mercury in Artisanal and Small-scale Gold Mining (ASGM). These efforts involve enhancing institutional capacity to regulate mercury use in ASGM and introducing alternative technologies for gold recovery at Marwa Marwa and Partners Site. This progress aims to sustain gold production, ensure smooth plant operation, and safeguard the environment and people within and outside the mining area. Therefore, NEMC is constructing Gold Ore Processing and Washing Facilities, recognizing their pivotal role in supporting operational activities.

Moreover, NEMC is committed to ensuring social and environmental responsibilities actively contribute to sustainable development and environmental protection, as part of this commitment NEMC is undertaking an Environmental and Social Impact Assessment (ESIA) for the proposed construction of the Gold Ore Processing and Washing Facilities to ensure sustainable environmental during the mining production process for Artisanal and Small-scale Gold Mining (ASGM) at Marwa Marwa and Partners Site.

Along with this, this chapter outlines an overview of the Tanzania administrative framework, key legislative requirements, and relevant international best practices applicable to the proposed construction of the Gold Ore Processing and Washing Facilities at Marwa Marwa and Partners Site.

3.2 ADMINISTRATIVE INSTITUTIONAL FRAMEWORK FOR THE MANAGEMENT OF THE ENVIRONMENT

The National Environmental Policy recognizes the need for a multi-focus approach in the management of the environment through existing administrative institutional mechanisms. It also seeks to enhance the coordination and cooperation of the institutionally distinct bodies with overlapping mandates. The institutional arrangement for environmental management in Tanzania is well spelled out in the EMA (2004). There are several institutions mentioned by the act, of which the Minister Responsible for the Environment is overall in charge of the administration of all matters relating to the environment. The institutional framework structure is provided based on key relevant sectors related to the undertaken project. See the figure below

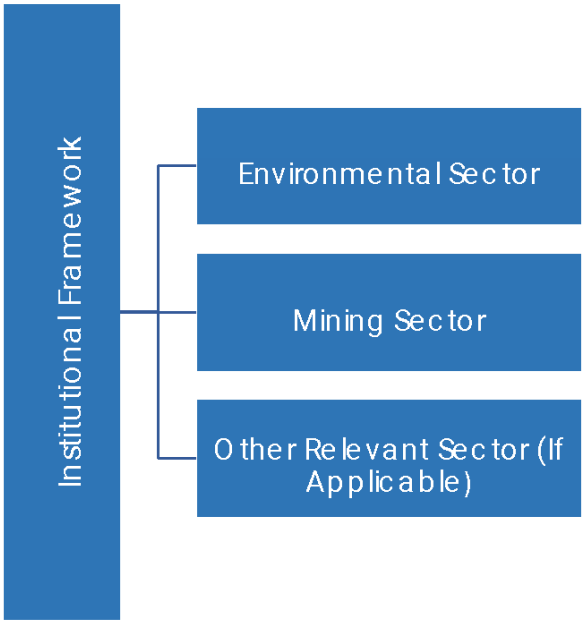


Figure 3-1: Institutional Framework Structure

3.2.1 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 labor chemicals, and occupational health and safety, and hence its administration framework.

Table 3-1: 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 levels – the Local Government Authorities (LGA). As per Environmental Management Act No. 20 of 2004, NEMC will be responsible for reviewing and monitoring Environmental Impact Assessments (EIA), and enforcing compliance with the project-approved ESMP
Vice President's Office (Division of Environment)	This Division has the overall responsibility of planning and implementing 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

Institution	Role
Ministry of Minerals (MoM) Through the Mining Commission (MC) which has officers at the Regional (RMO) and project site (MRO) level	• Enforce the requirements of Mining Act CAP 123 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 the 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.
President's 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 the 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 within the district. He is the main connection between the district and NEMC and VPO-Environment The District Social Officer is responsible for following up on gender and youth matters The District Community Development Officers register and follow up on the 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 resolution forums, and escalating grievances to the district-level
Occupational Safety and Health Authority	OSHA was set up in 2001 under the Ministry of Labor, 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 and technical advice, enforces legislation, proposes

Institution	Role
	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 chairpersons of catchment and sub-catchment committees which are responsible for the management of water sources. Responsible for monitoring 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 the issuance of importation and transport permits. Mercury is one of the chemicals that are regulated.
NGOs and Miners Associations	The Government's drive to formalize prospecting and Primary Mining Licenses and to stimulate the 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 the 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 legislation. 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 the Mining Commission is always on site and ensuring compliance with HSE requirements forms part of their portfolio

3.2.2 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 CAP 123 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 with a portion of land where they can operate (develop a mining shaft to extract ore and in some cases also construct a 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 recorded by the Cooperative Manager. The manager is assisted at a minimum by two personnel a Health, Safety, and Environment (HSE) Officer and Fundi. The HSE Officer is responsible for ensuring 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) 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

3.3 PROJECT LEGAL FRAMEWORK

The legal framework establishes the framework comprising Policies, laws, regulations, and guidelines/procedures that guide the entire project lifecycle from planning to decommissioning. It also defines the legal responsibilities and duties that project proponents must follow throughout the project lifecycle. This legal framework ensures that projects operate within established legal limits, considering factors like environmental, health, and safety, etc. Adhering to this framework is crucial for achieving project objectives while upholding compliance with relevant laws and regulations, thereby safeguarding the environment and community well-being.

3.3.1 Relevant Policies

The sections outline the policies to be considered when implementing the proposed project which guided managing the project by assessing where and how project development could be suitable and ensuring projects progress without negatively impacting the environment and the well-being of communities.

3.3.1.1 The National Environmental Policy (NEP), 2021

The National Environmental Policy (NEP) aims to coordinate environmental management that enhances the well-being of current and future generations. This necessitates engagement from the government and other stakeholders, as outlined in sections 2 (2.2.3 b) and 3 (3.6), which emphasize environmentally sound management, including land and water, and the promotion of a safe and healthy environment. The NEP also recognizes mining as a primary source of pollution, necessitating sound chemical and pollution management throughout the project life cycle. In alignment with the NEP, Marwa Marwa, and partner site mining operations continuously use mercury for gold production. In order to facilitate effective plant operation and safeguard environmental and community well-being, NEMC has secured financial support from the World Bank to oversee the construction of Gold Ore Processing and Washing Facilities. This initiative aims to promote environmental sustainability throughout the gold mining production process, particularly in Artisanal and Small-scale Gold Mining (ASGM) at Marwa Marwa and Partners Site. Additionally, NEMC is dedicated to ensuring that the operations of these facilities align with environmental protection standards. To achieve this, training sessions on facility handling are provided to those engaged in ASGM at Marwa Marwa and Partners Site, enhancing awareness and promoting responsible practices.

3.3.1.2 The National Mineral Policy, 2009

The mineral policy aims to enhance the mineral sector by integrating it with other economic sectors, boosting investments, maximizing benefits, improving the legal framework, and involving local communities in mining projects. Section 6 (6.1) of the policy outlines strategies for managing safety, occupational health, and the environment in mining activities, including enhancing environmental management systems and allocating funds for environmental rehabilitation and closure. To comply with the policy, NEMC is conducting an Environmental Impact Assessment for the construction of the Gold Ore Processing and Washing Facilities, to ensure proper environmental management is adhered to in all project phases and is aligned with the proposed mitigation measures, an Environmental and Social Management Plan (ESMP), and monitoring plans throughout the project lifecycle. Also, stakeholder consultation has been conducted, with their concerns and views detailed in chapter five of this report.

3.3.1.3 National Health Policy 2003

The main goal of the National Health Policy is to enhance the health and well-being of all individuals, especially those at risk, by promoting a responsive health system that takes into account environmental health and sanitation. Section 3 (3.5.2.5) of this policy emphasizes the significance of maintaining environmental cleanliness, monitoring water quality, and ensuring a safe environment for people. The proposed project will be designed as per local and international standards to guarantee that the Gold Ore Processing and Washing Facilities do not pose any harm to the environment and employees. Additionally, during the mobilization and construction phase, employees will be provided with personal protective equipment (PPE) and will be enforced to wear them and occupational health training also be conducted and provided to all employees.

3.3.1.4 The National Water Policy (2002)

The main objective of this water policy is to establish a comprehensive framework for sustainable development and management of the nation's water resources, with effective legal and institutional mechanisms for implementation and recognizing the importance of water resources for various socioeconomic activities such as agriculture, industry, mining, hydropower, and tourism, the policy emphasizes the need to manage and plan the use of surface and groundwater sustainably. As outlined in Section 4 (4.4.1), the policy requires the assessment of water quality for the project and the identification of measures to mitigate any negative impacts on water quality and quantity, along with the implementation of a monitoring plan to ensure compliance. The responsible water board will be overseeing the environmental impact of Artisanal and Small-scale Gold Mining (ASGM) at Marwa Marwa and Partners Site and should conduct regular monitoring of runoff and discharges from sluicing pits. Additionally, they should promote the adoption of pollution prevention measures by monitoring water quality in the vicinity of these facilities.

3.3.1.5 The National Occupational Health and Safety Policy, 2009

This policy aims to improve working conditions and alleviate poverty by offering high-quality Occupational Health and Safety (OHS) services which involve maintaining safe and healthy workplaces, managing and preventing hazards, and adjusting work processes to boost productivity. In Section 2 (2.3.1), the OHS Policy aims to decrease work-related accidents and

illnesses in Tanzania by fostering a culture of OHS hazard prevention among the Government, Employers, and Employees by preventing work-related incidents and diseases will bring about significant social and economic advantages. NEMC will ensure training is provided for employees and ensure they all have appropriate personal protective equipment before commencing work a designated HSE representative will be selected to conduct thorough inspections of all employees to ensure they put on their PPEs.

3.3.1.6 The National Land Policy (1995) Second Edition 1997

The main aim of the National Land Policy is to establish and guarantee a secure land tenure system, efficient utilization of land resources, and sustainable management of land for social and economic advancement, all while preserving ecological harmony. In Section 2 (2.4), the policy promotes the productive use of land to foster swift social and economic progress while safeguarding land resources from degradation for sustainable development. The proposed construction of the Gold Ore Processing and Washing Facilities will be undertaken within the PML and not be utilized for other purposes.

3.4 LEGAL FRAMEWORK

This section gives a summary of the legislation that governs environmental management in the health sector and other related issues that should be included in the Environmental Impact Assessment (EIA) of the construction of Gold Ore Processing and Washing Facilities at Marwa Marwa and Partners Site to ensure sustainable compliance.

3.5 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 the 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 environmental management of ASGM is regulated by the Environment Management Act 2004 (EMA), through the Environment Impact Assessment and Audit Regulations of 2005 as amended in 2018, ASGM activities need to obtain an EIA certificate and implement an Environment 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 3-2 Outlines the key legislation that ASGM needs to follow and their relevance to this project.

Table 3-2: Legislation that Governs the Project

Legislation	Description	Relevance to the Project
Mining Act CAP 123		
• 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 • Subjects the PML holders to follow regulations about Health and Environment protection allows to stack or dump 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 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. The certificate does not remove liabilities incurred before the certificate	Areas in which 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 the gold recovered from the plant is subjected to royalties
Section 95. Restrictions on the right of entry by mineral right holder	Need consent from 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 are not to hinder access or erect buildings without consent of the mineral right holder • Compensate for land disturbance/property damage	The site is 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 landowner 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 the HSE performance of their suppliers	The Cooperatives at the sites should ensure compliance
Section 105. Corporate Social Responsibility	Mineral rights holders are 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 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 EIA ensures compliance. The management of wastes proposed should align with the requirements

Legislation	Description	Relevance to the Project
Section 109. liability of the License holder for pollution damage	A license holder shall be responsible for pollution damage	The cooperatives operating the sites were aware that they were liable for environmental pollution by their activities but negligence was observed especially in solid waste and stormwater management
Mining (Mineral Rights) Regulations 2018 reg 16 Information and Reporting	Each year prepare a report on the machinery available, employees, wages, minerals produced, deaths, and accidents and submit it to the Mine Commission	The project needs to assign these responsibilities to the GOP administration
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 a presence of illegal mining; illegal processing and trading of minerals and active involvement of miners under eighteen years of age in mining activities; (b) yellow-flagged, where mining or processing is legal, but there is a lack of an environmental management plan or protection plan; (c) green-flagged, where infractions stated under paragraphs (a) and (b) are not present.	The project is to ensure that the selected sites do not fall under the red category. Most of the sites visited fell under the yellow category and hence the need for this ESIA
Mining (Safety, Occupational Health and Environmental Protection) Regulations 2010		

Legislation	Description	Relevance to the Project
Regulation 20: Safety Precautions to be observed	Requires all persons working or supervising work at the mine to ensure the 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 following of procedures and that works are 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 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 ashes, and wash water 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 an 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 the Standards Act 2009	These regulations align with the requirements of the EMA 2004 and provide for standards that the project areas are currently following
• Regulation 10. Settling Ponds • Regulation 11. No vegetation clearing	These provide for the protection of water sources from sedimentation and the conservation of riparian vegetation. Requires closed retort system to be used when heating	Cooperatives and miners in the project areas were aware of these requirements however as there was limited enforcement PPE was sparingly used.

Legislation	Description	Relevance to the Project
• 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 gear to be used	Gold/Mercury Amalgam. Making safe abandoned pits. They prohibit the engagement of persons less than 18 years old and require that PPE be used to limit contact with hazardous substances	There were no rehabilitation or safety measures put in place 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 the 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 to be undertaken and management plans to be implemented; employees not be exposed to harmful emissions; the provision of PPE to employees exposed to hazards; and provision of eye protection in rock-breaking activities	The facilities managers were not aware of the requirement to undertake a risk assessment. PPE was said to be provided however minimal uses and just gumboots were observed. No measures were in place 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

Legislation	Description	Relevance to the Project
Employment and Labour Relations Act of 2004		
Part II: Fundamental Rights and Protection	This part prohibits child labour, forced labour, and discrimination and requires employers to promote equal opportunities	All the project sites stated that no child labor was present and it was not obvious however absenteeism in primary and secondary schools due to boys engaged in work at mine sites was reported. Small children were noticed at the mines while their mothers were sorting and breaking rocks. There were norms for the division of work according to gender
Part III: Employment Standards	Gives minimum requirements for hours of work, rest, holidays, fair remuneration, 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 were 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 study is being undertaken to ensure compliance as ASGM activities fall in category B1

Legislation	Description	Relevance to the Project
EIA and Audit Regulations of 2005. Regulation 42. Developer to inform the council of changes in the undertaking	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 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 are to be conducted on ongoing projects that commenced before coming into force these regulations	PML holders should undertake Initial Environmental Audits and have an ESMP that will be fit for their operations and cover 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 are included in the 6th Schedule as chemicals 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 a 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		

Legislation	Description	Relevance to the Project
Section 23: Powers and Functions of Basin Water Boards	Bodies responsible for issuing, revoking, and monitoring water use and discharge permits, and pollution prevention measures	The responsible water board should monitor runoff and discharges from sluicing pits at these sites and encourage the implementation of pollution prevention measures

3.6 RELEVANT REGIONAL AND INTERNATIONAL CONVENTIONS

3.6.1 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 to domesticate the "Regional Initiative against the Illegal Exploitation of Natural Resources" (RINR) that was agreed upon 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 includes Angola, Burundi, the Central African Republic, the Democratic Republic of Congo, Kenya, the Republic of Congo, Rwanda, Uganda, Sudan, Tanzania, and Zambia which 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 labor 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 to be classified as Red Areas.

3.6.2 World Bank Environmental and Social Standards (ESS) 2018

The proposed project will be developed and implemented according to the requirements of the World Bank Environmental and Social Framework (ESF). The ESF sets out the World Bank's commitment to sustainable development. The ESF protects people and the environment from potential adverse impacts that could arise from Bank-financed projects and promotes sustainable development. The ESF enables the World Bank and Borrowers to better manage environmental and social risks of projects and to improve development outcomes. The ESF also places more emphasis on building Borrower governments own capacity to deal with environmental and social issues. The ESF offers broad and systematic coverage of environmental and social risks. It makes important advances in areas such as climate change; labor standards; transparency; nondiscrimination; social inclusion; public participation; and accountability including expanded roles for grievance mechanisms.

The ESF codifies best practice in development policies. It brings the World Bank's environmental and social protections into closer harmony with those of other development institutions; and encourages Client countries to use, and improve, their own national environment and social policies, when these policies are materially consistent with the ESF and supported by adequate implementation capacity. ESF provides an incentive for countries to develop and build their own environmental and social policies and capacity.

3.6.2 Environmental and Social Standards

The 10 Environmental and Social Standards (ESSs) set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing. The Bank believes that the application of these standards, by focusing on the identification and

management of environmental and social risks, will support Borrowers in their goal to reduce poverty and increase prosperity in a sustainable manner for the benefit of the environment and their citizens. The standards: (a) support Borrowers in achieving good international practice relating to environmental and social sustainability; (b) assist Borrowers in fulfilling their national and international environmental and social obligations; (c) enhance non-discrimination, transparency, participation, accountability and governance; and (d) enhance the sustainable development outcomes of projects through ongoing stakeholder engagement. The proposed project will apply the ESSs. Table 3.2 below presents the ESSs that are anticipated to be relevant.

Table 3.2: Application of World Bank's ESSs to the proposed project

ESSs	**Yes/No**	**Application**
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Yes	The site-specific environmental and social impacts will be managed through this report. The report has been prepared to recommend E&S measures to be incorporated into designs of the proposed project
ESS 2: Labor and Working Conditions	Yes	Workers will be contracted for the construction works and operation of the project. In order, to ensure fair treatment of workers, the project will ensure that terms and conditions of employment (hours, rest periods, annual leave, non-discrimination, equal opportunities and workers organizations) are aligned with the requirements of Tanzania law and ESS2. To protect workers appropriate Occupational Health and Safety (OHS) shall be applied to avoid the risk of ill health, accidents and injuries. The proponent will set labor management procedures with roles and responsibilities for monitoring primary suppliers. If child labor or forced labor cases are identified, the proponent will require the primary supplier to take appropriate steps to remedy them. Where remedy is not possible, the proponent will, within a reasonable period, shift the project's primary suppliers to suppliers that can demonstrate that they are meeting the relevant requirements of this ESS
ESS 3: Resource Efficiency and Pollution Prevention and Management	Yes	Different activities under the project components aim at avoiding or minimizing adverse impacts on human health and the environment by eliminating the hazard use of mercury in ASGM. The project proponent will adopt Good International Industry Practice (GIIP)

		alternatives for its environmentally sound and safe management and disposal of resultants wastes.
ESS 4: Community Health and Safety	Yes	The project will not have substantial risk to community health and safety. Only localized negative impacts (like dust emissions noise pollution during transportation of materials etc.) to sensitive receptors will need to be managed. Also, community safety especially is an issue of concern due to the influx of the project workers, and later on participants of the project, which might lead to GBV/ SEA/SH, as well as transmission of HIV/AIDs and other communicable diseases. Guidance on HIV/AIDs, COVID-19, GBV/SEA/SH and EHPMP project GRM shall be followed.
ESS 10: Stakeholder Engagement and Information Disclosure	Yes	The proponent will provide stakeholders with timely, relevant, understandable and accessible information, and consult with them in a culturally appropriate manner, which is free of manipulation, interference, coercion, discrimination and intimidation. During the this study stakeholders' engagement has been crucial part of the study in line with this standard.

3.6.3 WORLD BANK GROUP ENVIRONMENTAL, HEALTH AND SAFETY GUIDELINES

The World Bank Group (WBG) Environmental, Health, and Safety (EHS) Guidelines (General EHS Guidelines, April 30, 2007) are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document. The applicable EHS guidelines include: -

1. General EHS Guidelines and
2. Industry Specific EHS Guidelines for Mining

3.8.1 General EHS Guidelines

The General EHS Guidelines (April 30, 2007) provides guidance to users on common EHS issues potentially applicable to all industry sectors. The general guidelines provide GIIP advice relating to the following elements to protect human health and the environment.

Requirements for the proposed project are not a single set of rules but a combination of general and industry-specific measures. Here are some of the key requirements:

Environmental requirements:

•Environmental: Projects must develop and implement an EMSP to assess, manage, and monitor risks and impacts.

•Emissions and Effluents: Projects must meet specific performance levels for air emissions and liquid effluents. The General EHS Guidelines provide standards for common pollutants, while industry specific guidelines address issues.

•Waste Management: Projects must have plans for managing and disposing of hazardous and nonhazardous waste. This includes minimizing waste generation and preventing open burning.

•Water Conservation: Measures should be implemented to minimize water consumption in production processes.

•Noise Management: Projects must control noise emissions from construction and operation, with control techniques such as sound barriers and noise containments.

Health and safety requirements

•Occupational Health and Safety (OHS): Projects must implement measures to protect workers from hazards, including proper use of personal protective equipment (PPE) and training.

•Community Health and Safety: Measures must be taken to minimize community exposure to project related hazards, including safety for traffic, hazardous materials transport, and emergency response planning.

•Emergency Planning: Projects must have plans for responding to emergencies like fires, chemical spills, or workplace accidents.

The WBG General EHS Guidelines are relevant to the proposed project as they provide internationally accepted GIIP for relevant EHS issues. The recommendations contained in the guidelines were reviewed during the preparation of this report and were incorporated into the prescribed management and mitigation measures as appropriate.

3.8.2 EHS Guidelines for Mining

The EHS Guidelines for Mining are applicable to underground and open-pit mining, alluvial mining, solution mining, and marine dredging. Potential environmental issues associated with mining activities may include management of the following: -

10. Water use and quality.
11. Wastes.
12. Hazardous materials.
13. Land use and biodiversity.
14. Air quality.
15. Noise and vibrations.
16. Energy Use; and
17. Visual Impacts.

The recommendations contained in the guidelines were also reviewed and incorporated into the prescribed management and mitigation measures as appropriate. Further, the guidelines provides minimum standard limits which are required to be monitored and adhered to.

4 CHAPTER FOUR: BASELINE ENVIRONMENT

4.1 GENERAL OVERVIEW AND APPROACH

This chapter provides information on the relevant environmental baseline for the project site which with the 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. The collection of baseline data therefore focused on providing information to support the assessment of any potential impact of the Project. Information was therefore collected at the following levels

- National Level: Secondary information was collected at the national level to provide a high-level contextual overview of Tanzania.
- Regional Level: Secondary information was collected at the county level aimed at providing a contextual overview of the Singida region.
- Project Site: Secondary and primary information was collected within the Project Site specifically within Sambaru Village where the Project is located. This included a 500m radius (Area of Influence) from the Site.

To collect the above information, the following methodology was employed:

- Desktop Study: A desktop review of publicly available data such as socioeconomic profile and existing studies was carried out to investigate the natural environment that exists at the three levels outlined above.
- Site survey: Site visits were conducted. During the site visits, information pertaining to the natural environment, particularly related to existing flora, fauna, soils, and hydrology within the Area of Influence, Project Footprint, and Project Site data was collected.
- Stakeholder Engagement: Different stakeholders were consulted from the local level to the regional level to collect views and concerns regarding the project.

Below section describes the existing physical and biological conditions of the Site and surrounding areas

4.2 PHYSICAL ENVIRONMENT

4.2.1 Climate

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

4.2.2 Temperature

From the dataset provided, the average temperature at Ikungi ranges from a minimum of 13^0C to a maximum of 29^0C. The hottest month is November and the coldest month is July. Daily temperature difference is about 7.5 – 14^0C.

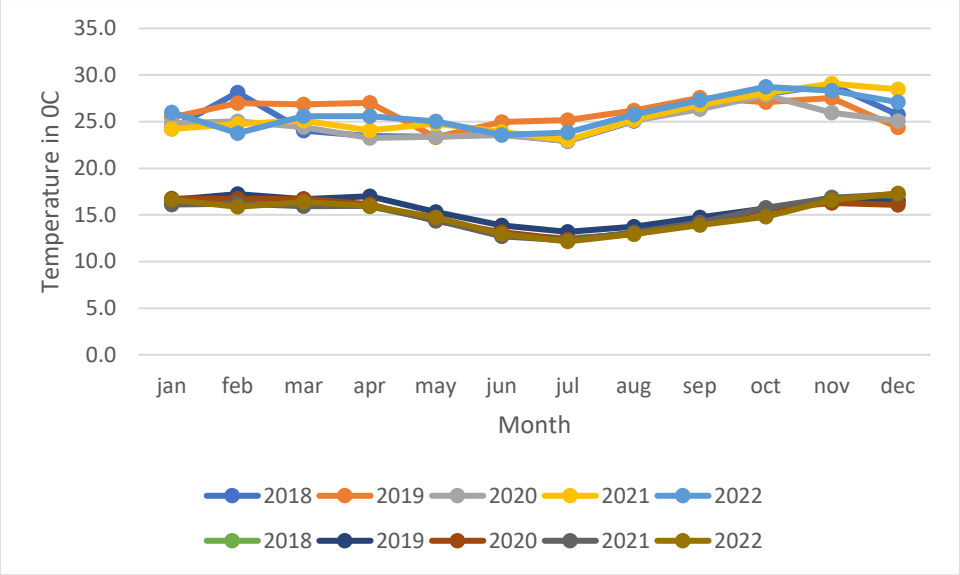


Figure 4-1: Temperature Patterns at Ikungi District

4.2.3 Rainfall

Ikungi district falls into a region with one high rainfall maxima. The rainy season starts in October to May and the dry season from June to September with almost no precipitation at all. During the dry months, the temperature is lower whilst in the rainy season the temperature is higher.

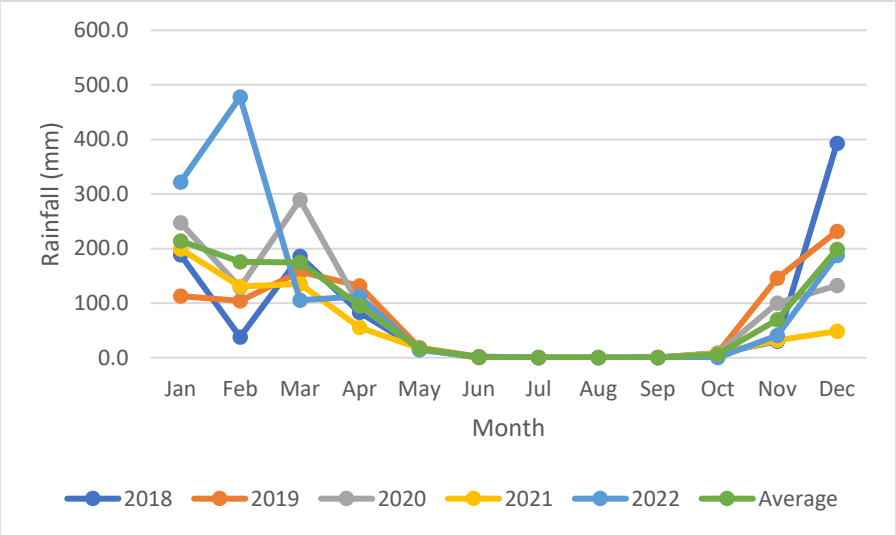


Figure 4-2: Annual Rainfall Patterns at Ikungi District

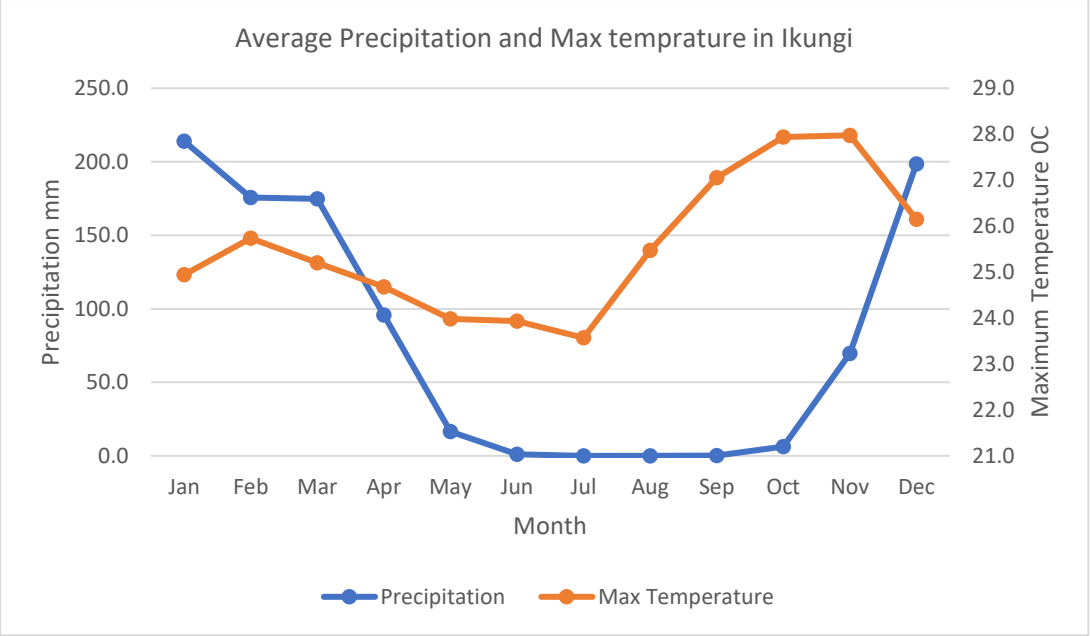


Figure 4-3:Annual Precipitation Pattern

4.2.4 Evaporation

On average, the annual evaporation rate in Singida exceeds precipitation as during the dry season which is characterized by no rainfall at all the evaporation is high.

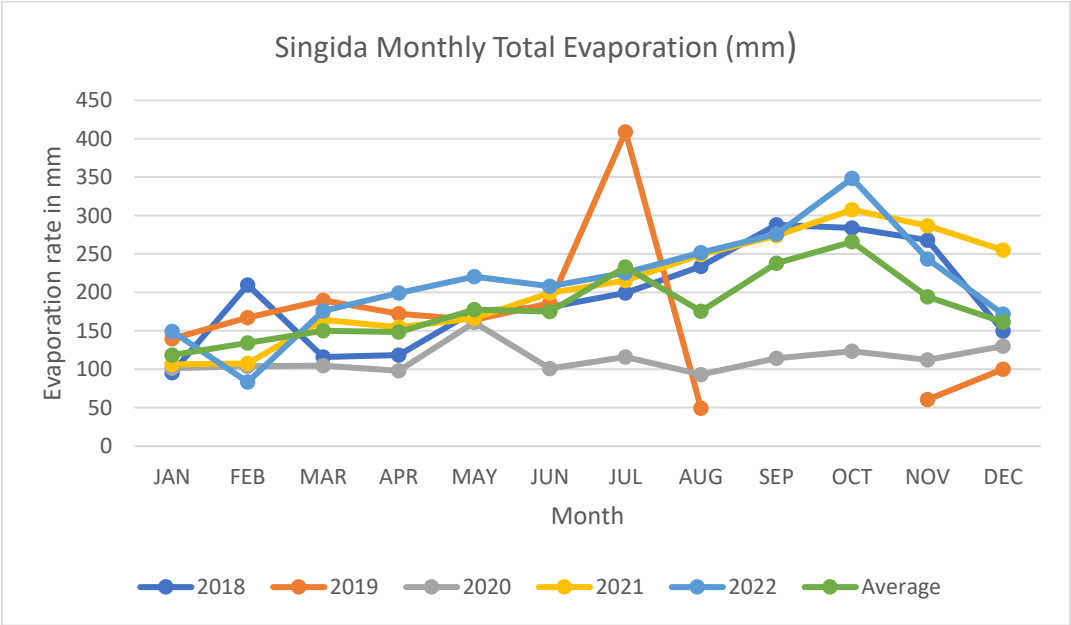


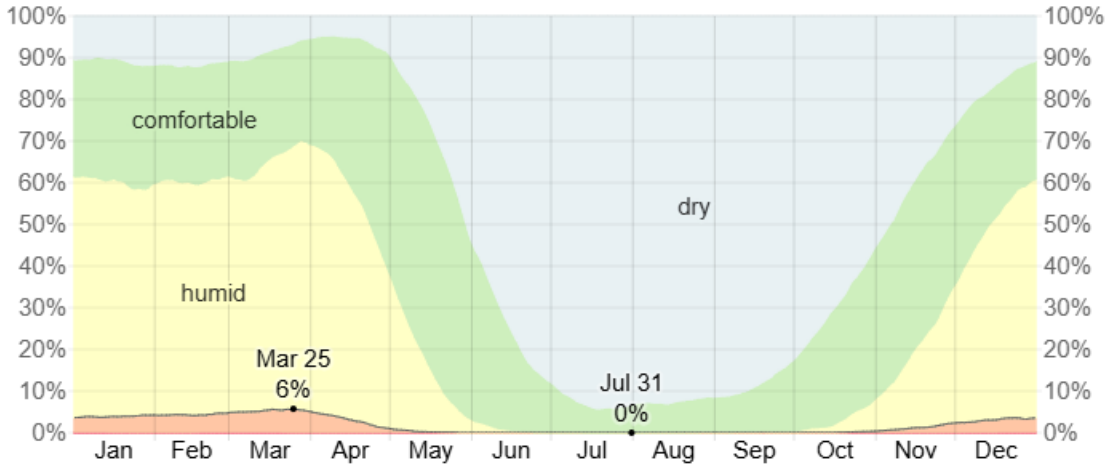
Figure 4-4: Evaporation Rates recorded in Iramba

4.2.5 Humidity

Ikungi District experiences seasonal humidity changes, with high humidity from January to April and extreme dryness from June to September. Humidity peaks in late March, while July is the

driest month with 0% oppressive humidity. Conditions start to rise again from October to December as the wet season returns.

These changes impact gold mining and processing. High humidity increases moisture in ore, affecting grinding and leaching efficiency, while dry conditions cause excessive dust and evaporation in processing ponds. To manage these challenges, mining operations must use controlled ore drying, dust suppression, and proper storage facilities.



Source: https://weatherspark.com/y/98080/Average-Weather-in-Ikungi-Tanzania-Year-Round

4.2.6 Wind Speed and Wind Direction

The wind rose below shows that the predominant wind blows from East to West for the majority of the time recorded, approximately 3800 hours of that time with a maximum speed of greater than 28km/h, and approximately 3800 hours of that time with a speed of greater than 19km/h. Also, a wind with a speed of above 19km/h was recorded blowing from ESE to WNW for a total of 2000 hours of the time recorded.

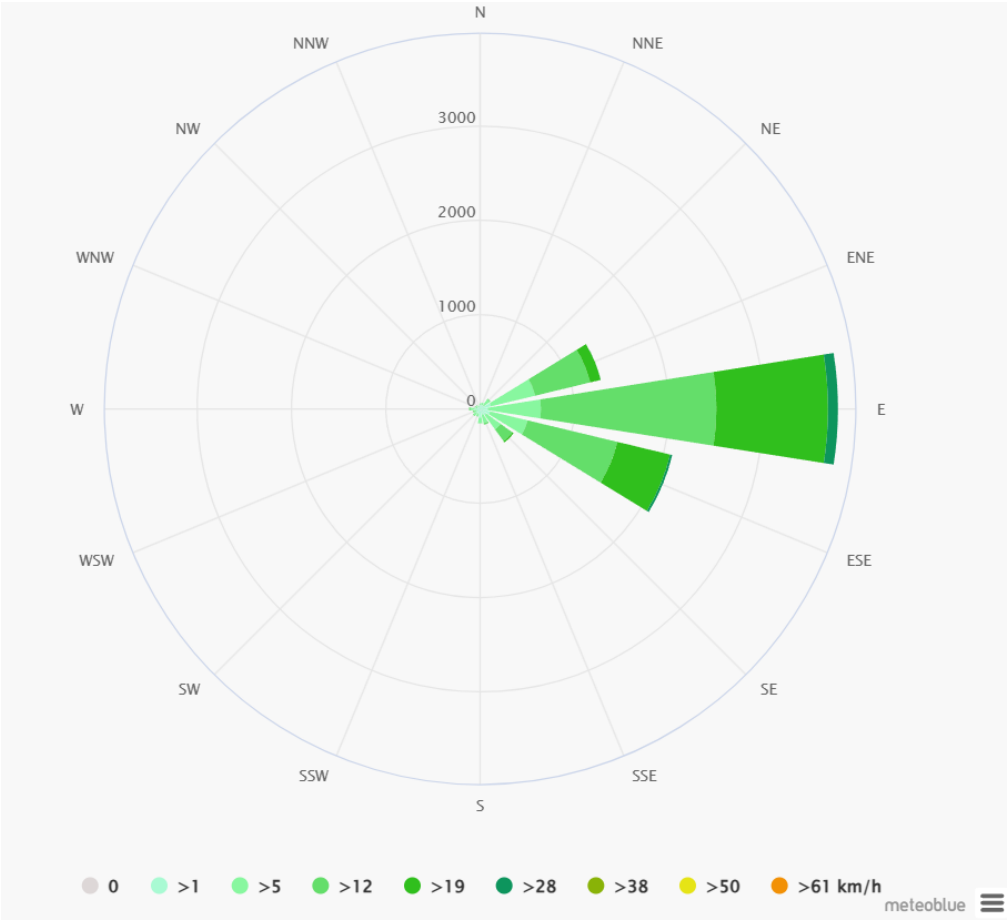


Figure 4-5: Windrose for Ikungi District

(Source: Simulated historical climate & weather data for Ikungi - meteoblue)

4.2.7 Topography

Ikungi district occupies the northern part of the central plateau of Tanzania which has elevations ranging from 1,200m to 1,500m above sea level. At Sambaru, where the project is located the elevation was about 1200m. There are no permanent rivers in the district

4.2.8 Geology and Soils

The Ikungi District Social Economic Profile reports that volcanic soils of high agricultural potential are found in the Mongonya ward where the project is located and its neighboring Sambaru ward. Surface soil samples were taken by the PIT at two points in Sambaru (Sambaru S14 and Sambaru S15) 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.

4.2.9 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 the GEM Foundation and the METEOR Project Consortium included in Figure 4-6 shows that Ikungi district

is in an area with medium seismic potential and the potential ground accelerations is between 0.1 and 0.15g. The residents of Sambaru reported that tremors are sometimes felt but without damage to mine workings and infrastructure. In the past year, 12 earthquakes have been recorded in the Ikungi district with a magnitude ranging from 4.3 – 5.5 the latest being on September 17th, 2023 with a magnitude of 4.3.[2]

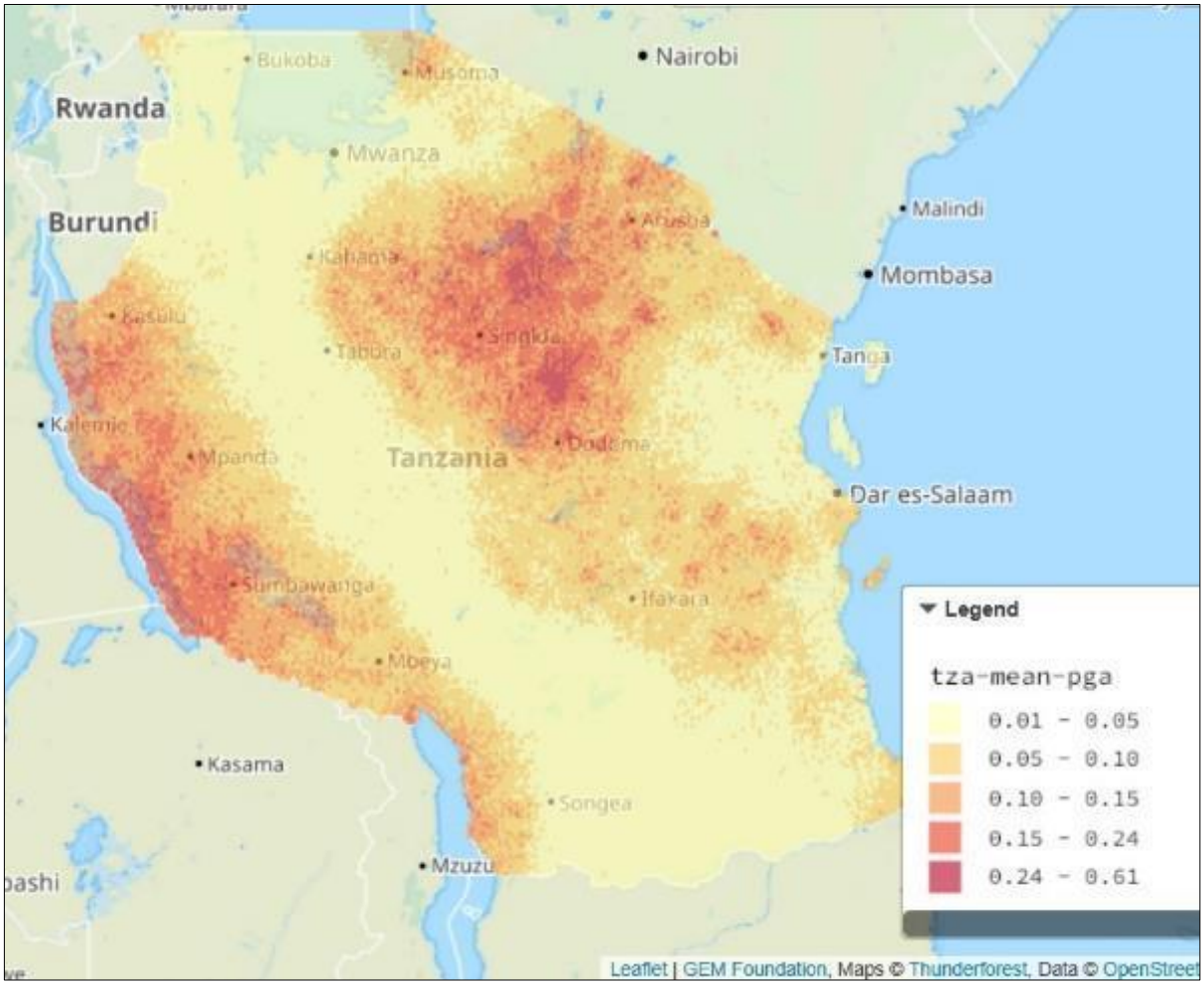


Figure 4-6: Tanzania Seismicity Hazard Map

(Source: METEOR Explorer - Tanzania Seismic Hazard Map (meteor-project.org)

4.3 BIOLOGICAL ENVIRONMENT

4.3.1 Flora and Fauna

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

[2] Earthquakes in Ikungi, Singida, Tanzania - Most Recent (earthquaketrack.com)

4.3.1.1 Flora

Data from secondary sources state about 70% of Ikungi district is covered by forests, woodland, thickets, and grassland. The district is endowed with a large area of natural vegetation covered with abundant forest with patches of water-logged areas and Hyparrhenia *spp*. The predominant vegetation is acacia, Miombo species, and associated species such as *Pterocarpus sp*, and Itigi thickets which cover most of the land. Other species are *Braghystia spp* (Mitunduru), *Afzelia quanzensis* (Mkora) *Podocarpus sp* (Mipyuhihi) *Syzygium cumini* (Mizambarau), *Albiric sp* (Mfuru), *Acacia spp* (Migunga), *Bombax sp* (Misufi) and *Euphorbia tirucalli* (Minyaa).

This was complemented by the information from the field study which identified three vegetation types in the project area including open Miombo Woodland, Thicket bushland, and Settlements with alien plants.

- **Open Miombo Woodland**

This vegetation is characterized by the presence of Miombo species mainly Brachystegia species (Figure 4-7). This vegetation type was found at the Marwa Marwa and partner sites and surroundings with mining, buildings, and rock dumps placed within the trees. This vegetation is an important resource as reported by the District Environment Officer and the Sambaru Mining Community that they obtain timbers (*Brachystegia sp*) for supporting mining shafts from these forests within their locality. Other uses include being a source of firewood and building poles. No species that require special conservation concern are found in the project area.


Figure 4-7: Miombo woodland at Marwa Marwa and Partners Site
Source: City Engineering Co. Ltd – Site Visit, November 2023

- **Thicket Bushland**

These are vegetation types with thick shrubland to low forest, characterized by much-branched, often armed trees and shrubs, thickly interlaced with climbers, and almost impenetrable with a height of 8 to 10 m. The vegetation type is traditionally known to provide habitat for keystone wildlife i.e., Elephant. Although it's threatened by the expansion of

cultivation fields, collection of firewood, and developmental activities. The vegetation type was patchily observed outside the project area.

Figure 4-8: Thicket Bushland within proximity to Marwa Marwa and Partners Site
Source: City Engineering Co. Ltd – Site Visit, November 2023

- **Settlements with Alien Plants**

The vegetation type is characterized by the absence of native species replaced with infrastructure and alien plant species. It is located outside the project area in Sambaru village. The common alien plants included *Senna siamea (*Swahili Mjohoro*)* (Figure 4-9), and *Mangifera indica (*Mango Tree*)*. The vegetation provides accommodation, fruits, and shade. However, the site survey was conducted during the onset of the rainy season hence cultivation had not intensively started. In addition, a few invasive alien plant species were also observed including *Nicotiana glauca* (Wild Tobacco).

Figure 4-9: *Senna Siamea* Tree in Sambaru Village

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

4.3.1.2 Fauna

The project site is within an area with limited land disturbance dominated by miombo vegetation. Few species were opportunistically observed and reported in the project site including Vervet monkey and Olive baboon (Gilbert, 2017). All the identified animals 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" and are not a focus of conservationists because they do not appear to be facing any immediate threat.

4.4 WATER RESOURCES

This section describes the current state of water resources within the Sambaru 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 an understanding of the existing conditions, the baseline data not only informs effective mitigation strategies and management plans but also ensures regulatory compliance.

4.4.1 Hydrology and Surface Water Resources

4.4.1.1 Regional Hydrology

The study area falls within the boundaries of the Internal Drainage Basin (IDB). The basin is situated in the north-eastern part of the country. It is the second largest basin in Tanzania, which extends over 6 regions (Arusha, Shinyanga, Manyara, Dodoma, Singida, and Tabora) with a nominal area of 142,200 km^2 inside Tanzania. The annual precipitation in almost the whole IDB ranges from 600mm to 900mm with an annual evapotranspiration rate of over 2,000mm and an average temperature range between 25^0C and 30^0C during day time and falls between 15^0C - and 20^0C at night. The internal drainage basin is subdivided into nine (09) subbasins as shown in Figure 4-10.

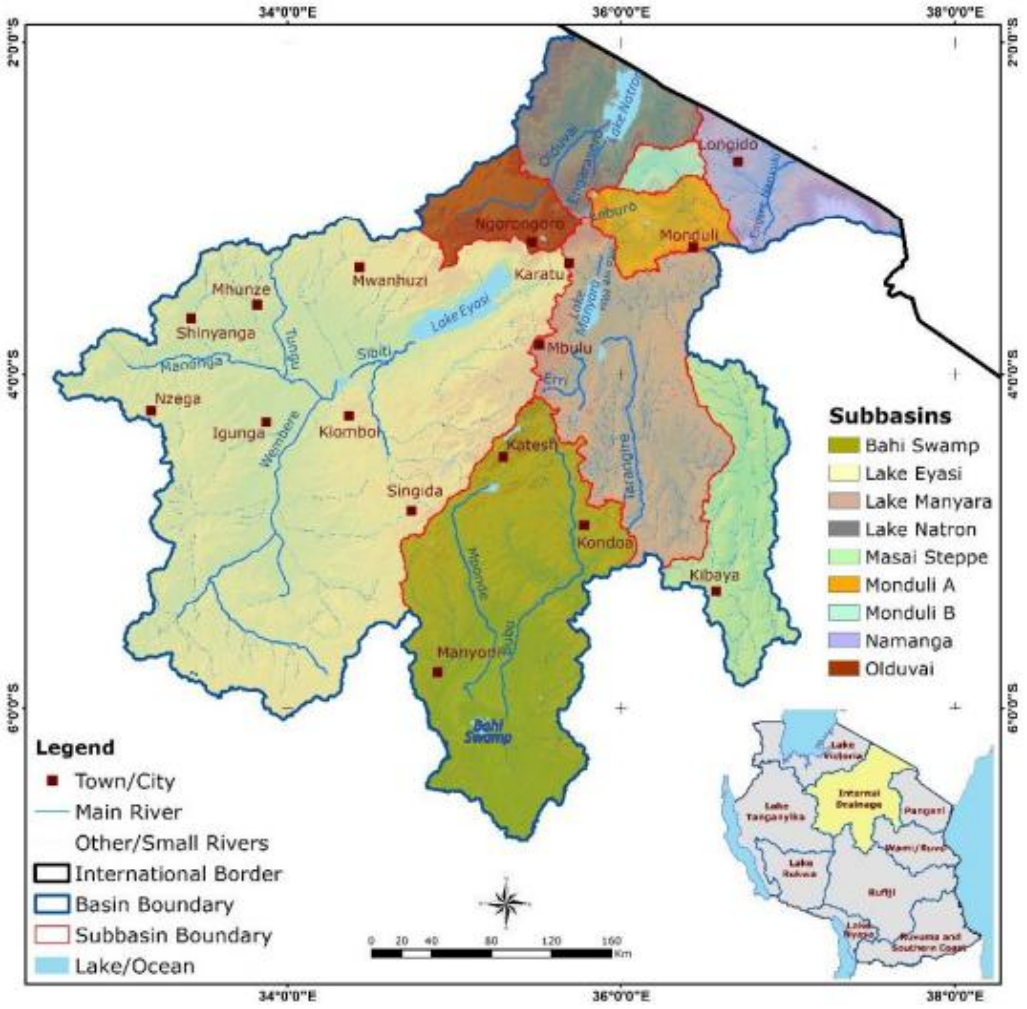


Figure 4-10: Internal Drainage Basin
Source (Tanzania Ministry of Water)

The specific area of study is located within the Bahi subbasin. The notable hydrological feature in this subbasin is the Bahi Swamp also known as Lake Sulunga. The Bahi wetland is a shallow ephemeral lake within the Bahi depression, part of the Eastern Rift Valley. It holds significant importance for local communities who engage in activities like cultivation, livestock keeping, and fishing. The lake covers around 974 km2 and sits at an altitude of 830 masl. The lake's size fluctuates based on precipitation, sometimes drying up completely. It lacks a defined outflow and receives water from seasonal rivers, predominantly from the north, with Bubu and Mponde being the largest. Other contributing rivers include Lawila, Nkojigwe, Msemembo, Maduma, and Zuboro. The total catchment area is 23,447 km2, and all rivers are ephemeral, typically ceasing flow during the dry season (May to December).

4.4.1.2 Sambaru Area Drainage

Figure 4-11 illustrates the boundaries of the Sambaru watershed, delineated utilizing ArcGIS software and a 30x30m resolution digital elevation model (DEM). This watershed is characterized by a network of seasonal streams that converge into major streams (Figure 4-12), extending southeast across the landscape. Eventually, these streams contribute to the

River Mponde's flow, which courses Southward and southeastward into Bahi Swamp. Bahi Swamp acts as the destination for water carried by this river.

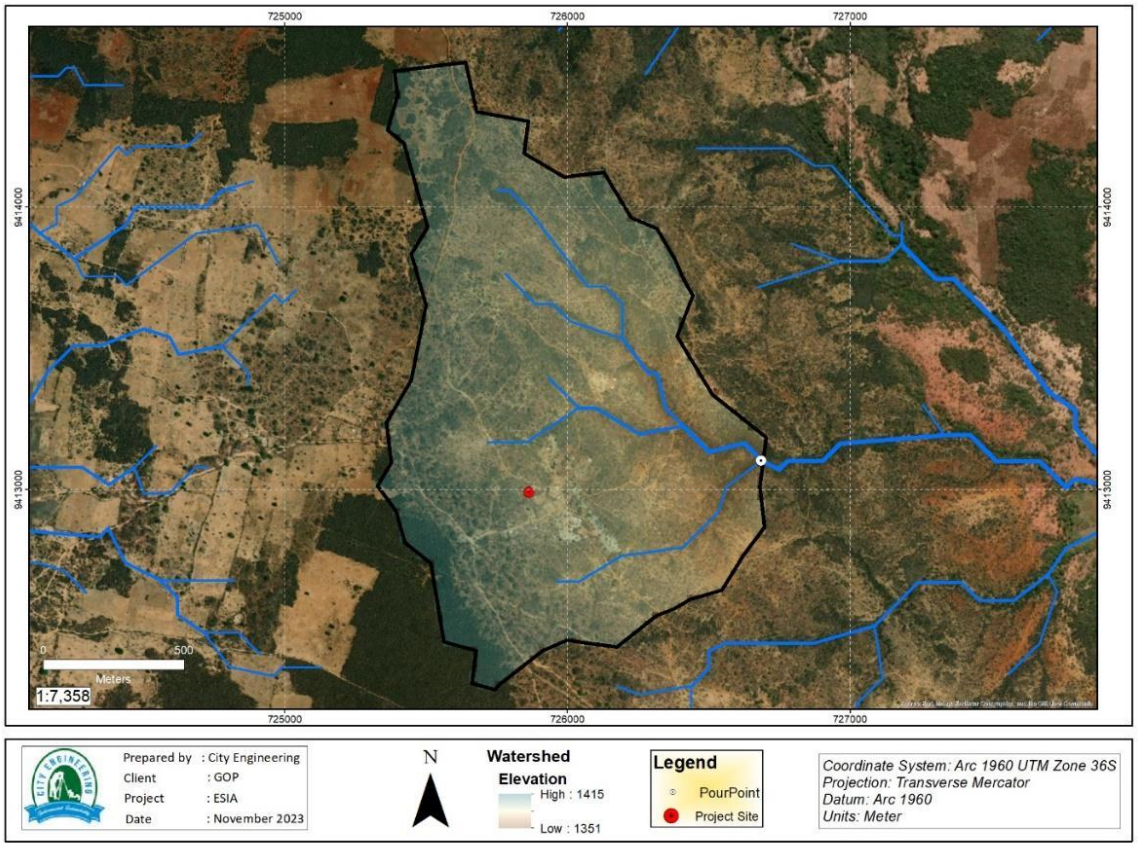


Figure 4-11: Watershed containing Sambaru Project Area
Source (City Engineering Company Limited)

Figure 4-12: A significant Seasonal stream in Sambaru village
Source (CECL Site Visit, November 2023)

4.4.2 Groundwater

The miners at the Marwa Marwa site informed the team that they had not encountered any groundwater and some of their shafts were more than 60m deep. Two groundwater sources were identified during the field study one well is located approximately 5km away from the Marwa Marwa mine site, this well is owned by one of the locals, Mr Abubakari Magoma. This well serves as the principal freshwater supply for the village and the small-scale miners. This water source is utilized for various activities, ranging from domestic use to production. The second well is public and is located 10km away from the mine site at Sambaru village centre, the well is also used for domestic applications and rarely for mining operations due to the hauling distance to the mine site.

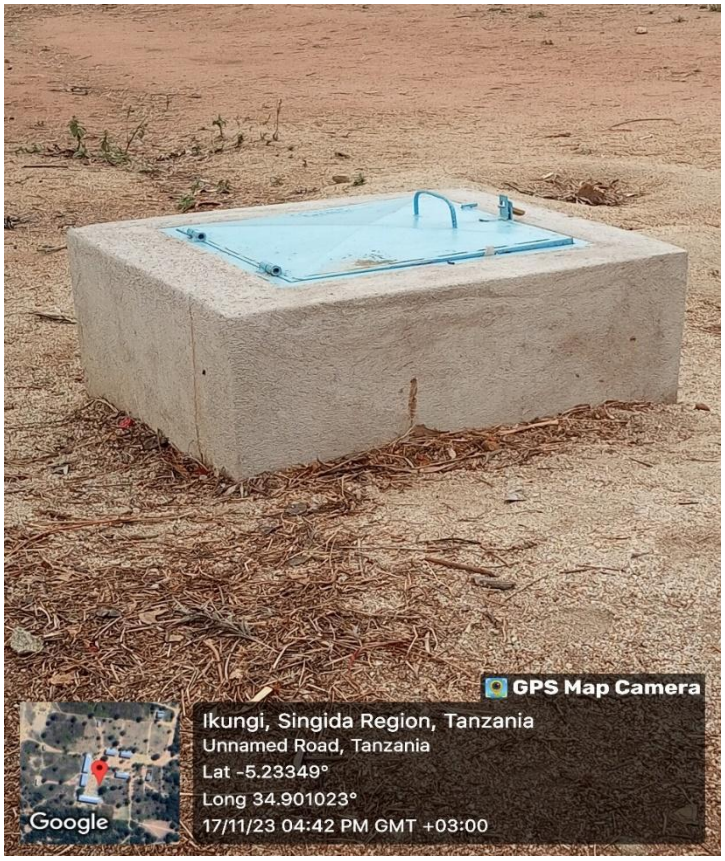


Figure 4-13: The main source of water for miners in Sambaru village
Source (CECL Site Visit, November 2023)

4.4.3 Water Quality

Water quality baseline conditions were established through in-situ measurements and laboratory analysis of selected heavy metals at representative locations within and around the project area. Sampling was conducted at a seasonal stream (Coordinates: -5.23099°, 34.98838°) representing surface water influenced by runoff, and a groundwater well (Coordinates: -5.23349°, 34.901023°) representing a key source of potable water for the surrounding community.

Field measurements included pH, turbidity, Total Dissolved Solids (TDS), and temperature, providing an indication of the general physicochemical characteristics of the water sources. The results indicate that the seasonal stream exhibits elevated levels of Total Dissolved Solids (TDS) and turbidity, exceeding the permissible limits of 1200 mg/l and 30 NTU, respectively, as specified in TZS 860:2019. These elevated values are consistent with sediment load and dissolved materials transported through runoff and erosion processes, particularly during rainfall events.

In contrast, the groundwater well exhibited stable physicochemical characteristics, with all measured parameters falling within the acceptable limits for drinking water. This indicates that the well water is of good quality and suitable for domestic use, with minimal influence from surface disturbances.

Laboratory analysis focused on key heavy metals including mercury (Hg), arsenic (As), cadmium (Cd), lead (Pb), copper (Cu), zinc (Zn), chromium (Cr), and nickel (Ni). The results indicate that in the seasonal stream, lead (Pb) was slightly elevated above the permissible limit, while all other analyzed metals remained within prescribed standards. This is attributed to mobilization of trace metals from soils and geological materials through surface runoff.

For the groundwater well, all analyzed heavy metals, including lead, were found to be within the permissible limits, indicating no significant contamination and confirming its suitability as a safe water source for domestic and limited productive uses.

Overall, the results demonstrate that surface water quality is influenced by sediment-related parameters and localized metal mobilization, whereas groundwater quality remains within acceptable standards, providing a reliable and safe source of water for the local community.

Table 4.1: Water Quality Results for Seasonal Stream and Groundwater Well

S/n	Parameter	Units	Seasonal Stream	Groundwater Well	TZS 860:2019 Limits
1	pH	-	6.75	7.42	6.5 – 8.5
2	TDS	mg/l	2980	620	1200
3	Turbidity	NTU	540	8	30
4	Copper (Cu)	mg/l	<0.01	<0.01	3.0
5	Lead (Pb)	mg/l	0.013	0.006	0.01
6	Zinc (Zn)	mg/l	<0.01	<0.01	5.0
7	Cadmium (Cd)	mg/l	<0.01	<0.01	0.05
8	Chromium (Cr)	mg/l	<0.01	<0.01	0.05
9	Nickel (Ni)	mg/l	<0.01	<0.01	NM
10	Mercury (Hg)	mg/l	<0.01	<0.01	0.01

4.4.4 Air Quality

Air quality baseline conditions were established through systematic monitoring of key criteria pollutants at representative locations within and around the Sambaru project area, which is influenced by artisanal and small-scale mining activities. The monitoring aimed to characterize the ambient air environment, providing a baseline for assessing future impacts and potential exposure risks to workers and nearby communities.

Three monitoring points were established to capture variations in air quality associated with mining operations and surrounding areas:

- Monitoring Point 1 *(-5.23099°, 34.98838°)* was located near the seasonal stream and active mining zone, representing an area potentially influenced by excavation, ore handling, and surface disturbances.
- Monitoring Point 2 *(-5.23349°, 34.901023°)* was positioned near a groundwater well and community-use area, representing conditions relevant to human exposure in residential settings.
- Monitoring Point 3 *(-5.23210°, 34.94500°)* was selected within an intermediate zone between the active mining area and community-use locations, capturing air quality conditions downwind of mining and processing activities in line with the predominant East-to-West wind direction.

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 ($PM_{2.5}$ and PM_{10}). These pollutants are particularly relevant in artisanal mining environments due to the use of diesel-powered equipment, ore crushing, haulage activities, and occasional biomass burning.

Wind conditions in the area, as illustrated in Figure 4-5, indicate that the predominant wind direction is from East to West, with significant wind speeds exceeding 19 km/h and 28 km/h for extended periods. This wind pattern plays an important role in the dispersion of airborne pollutants, particularly dust generated from mining activities, and may influence the transport of particulate matter toward downwind receptors, including settlements and water bodies.

The results indicate that ambient concentrations of gaseous pollutants (CO, NO_2, O_3, VOC, and SO_2) remain low and within the limits prescribed by TZS 845:2007 and the World Bank Environmental, Health and Safety Guidelines (EHS). However, particulate matter ($PM_{2.5}$ and PM_{10}) shows localized elevation near active mining and material handling areas, primarily due to dust generation from excavation, crushing, and vehicle movement.

Overall, the findings suggest that while current air quality conditions are generally within acceptable standards, particulate emissions represent the most significant parameter of concern in the project area. These results provide a reliable baseline for future monitoring, particularly as mining activities expand or intensify.

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

Location	Coordinates	CO (ppm)	NO_2 (ppm)	O_3 (ppm)	VOC (ppm)	SO_2 (ppm)	PM2.5 (ppm)	PM10 (ppm)
Monitoring Point 1	-5.23099°, 34.98838°	0.6	0.02	0.03	0.11	0.00	0.015	0.030
Monitoring Point 2	-5.23349°, 34.901023°	0.5	0.02	0.03	0.10	0.00	0.010	0.022
Monitoring Point 3	3: -5.23210°, 34.94500°	0.6	0.03	0.04	0.12	0.00	0.014	0.028
TZS 845:2007		20	0.1	0.1	10	0.05	0.05–0.08	0.05–0.116
World Bank EHSGs		10	0.2	0.1 (8hr)	NM	0.125	0.075	0.15

4.4.5 Noise and Vibration

Noise measurements were taken by the PIT at one-point Sambaru N12 using a sound level meter PCE 322A and the level of Noise recorded was 56dBA which is below the maximum permissible levels for the general environment included in the Environment Management (Quality Standards for the Control of Noise and Vibration Pollution) Regulations of 2015 for areas used for residential and industry small scale production and commerce of 60dBA daytime, however, it was higher than the 50dBA nighttime. Information on when the measurement was taken was not available. However, as these communities are gold rushes and heavily depend on mining and mineral processing this is not considered a nuisance.

Noise baseline conditions were established through in-situ measurements at representative locations within and around the Sambaru project area, which is influenced by artisanal and small-scale mining activities. The monitoring aimed to characterize the existing acoustic environment, providing a benchmark against which future noise impacts can be assessed and potential exposure to workers and nearby communities evaluated.

Three monitoring points were selected to capture variations in noise levels associated with mining operations and surrounding areas:

- Monitoring Point N1 (-5.23099°, 34.98838°) was established near the seasonal stream and active mining zone, representing areas influenced by excavation, ore crushing, material handling, and operation of diesel-powered equipment
- Monitoring Point N2 (-5.23349°, 34.901023°) was positioned near a groundwater well and community-use area, representing residential and communal zones where local populations may be exposed to noise from mining activities

- Monitoring Point N3 (-5.23210°, 34.94500°) was selected within an intermediate zone between the active mining area and community-use locations, capturing noise conditions downwind of mining and processing activities, consistent with the predominant East-to-West wind direction

Noise measurements were conducted using a Sound Level Meter (PCE-322A). The recorded noise levels indicate moderate variation across monitoring points, reflecting differences in proximity to mining operations, background community activities, and vehicle movement.

The results show that noise levels are highest near community-use areas, likely due to combined background and anthropogenic sources. When compared with the Tanzania Environmental Management (Noise and Vibration Pollution) Regulations, 2015, the recorded values exceed the recommended daytime limit for residential areas (60 dBA) at the monitored locations, particularly N2, while N1 shows slightly lower levels closer to the mining source.

Overall, the findings indicate that noise generated from mining operations and associated activities contributes to elevated ambient noise levels, especially in zones closer to community receptors. These results provide a reliable baseline for implementing noise management measures and monitoring potential impacts as mining activities expand or intensify

Table 4-3: Summary of Baseline Noise Measurements at Sambaru Site

Location	**Coordinates**	**Noise Level (dBA)**
Monitoring Point N1	-5.23099°, 34.98838°	65
Monitoring Point N2	-5.23349°, 34.901023°	72
Monitoring Point N3	-5.23210°, 34.94500°	68
Tanzania Standards		
Residential Areas (Daytime)		60
Residential Areas (Nighttime)		50
World Bank EHSGs		
Residential Areas (Daytime)		55
Residential Areas (Nighttime)		45

4.5 SOCIO-ECONOMIC BASELINE

This chapter describes the existing socio-economic status of the study area from the regional level to the ward and village level that are likely to experience direct and indirect benefits/impacts associated with the proposed Project.

4.6 REGIONAL LEVEL

4.6.1 Geographic Location and Administration

Singida region is located in the central part of Tanzania and lies south of the equator, spanning latitudes 30°52' to 70°34'. Longitudinally, it extends between 33°27' and 35°26' east of Greenwich. It borders the Shinyanga and Simiyu regions to the north, the Arusha and Manyara regions to the northeast, the Dodoma region to the east, the Iringa and Mbeya regions to the south, and the Tabora region to the west.

Administratively Singida Region has seven Local Government Authorities namely Singida Municipal Council, Singida District Council, Manyoni District Council, Mkalama District Council, Itigi District Council, Iramba District Council,I and Ikungi District Council

4.7 DEMOGRAPHIC PROFILES AT REGIONAL LEVEL

4.7.1 Population

According to the 2022 National Population and Housing Census, the Singida Region had a total population of 2,008,058, comprising both males and females. Specifically, there were 995,703 males and 1,012,355 females, resulting in a sex ratio of 98, indicating a slight predominance of females. The region had 395,855 households, with an average household size of 5.1

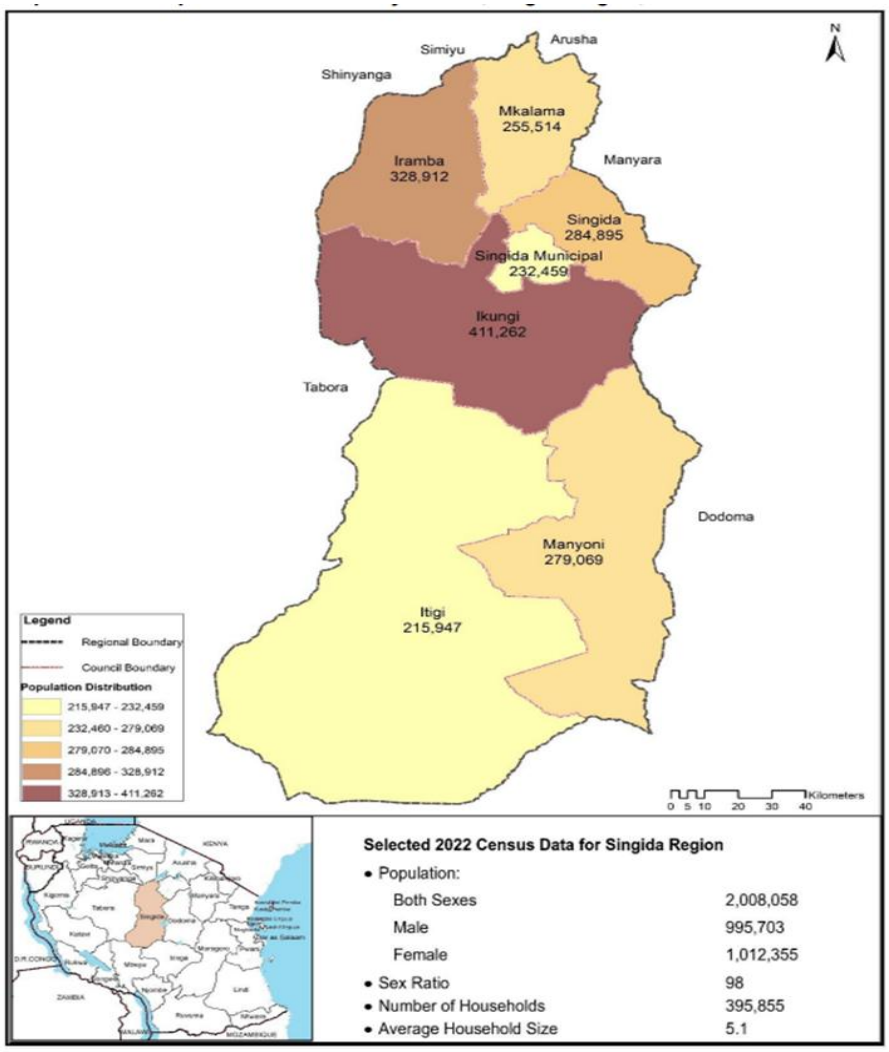


Figure 4-14: District Councils in the Singida Region

(Source: NBS, 2023[3])

Administrative_units_Population_Distribution_Report_Tanzania_Mainland_volume1b.pdf (nbs.go.tz)

4.7.2 Land Area, Land Use Pattern

Singida region has a total surface area of 49,438 sq. km and this is heavily in favor of Manyoni (57.9 percent) and Ikungi district (14.9 percent) followed by Iramba, Singida DC Mkalama, and last Singida MC. As illustrated in the table below

Table 4-1: Distribution of Surface Area by District in Singida Region

3

District	Area (sq.Km)			
	Land Area	Water Area	Total Area	Percent of Surface Area
Iramba	4,549.4	22	4,571	9.2
Singida DC	4,770.7	50	4,821	9.8
Manyoni	28,620.0		28,620	57.9
Singida MC	730.5	23.50	754	1.5
Mkalama	3,328.7		3,329	6.7
Ikungi	7,343.3		7,343	14.9

4.7.3 Ethnicity and Cultural Heritage

The main indigenous ethnic groups include the Nyaturu, Nyiramba, Sukuma, Gogo, and Taturu. Other significant minority groups are the Nyisanzu, Barbaig, Hadzabe, Kimbu, and Sangu. The Nyiramba primarily reside in the Iramba district, while the Sukuma, Gogo, Sangu, and Taturu are prominent in the Manyoni District and Itigi. In contrast, the Nyaturu are the predominant ethnic group in Singida District Council and Ikungi District, as well as Singida Municipal Council and Manyoni districts. The Hadzabe (Tindiga) people, mostly located in Mkalama Districts, constitute a special interest group that relies on hunting, gathering wild plants, and harvesting honey. The Barbaig are situated in Singida Districts Council.

Table 4-2: Number of Major Ethnic Groups by District in Singida Region

District	Number of Major Ethnic Group	Major Ethnic Groups
Iramba	4	Nyiramba, Sukuma, Taturu and Barbaig
Singida DC	7	Nyaturu, Kimbu, Barbaig, Nyiramba, Sukuma, Hadzabe and Taturu.
Manyoni	7	Gogo, Sukuma, Nyaturu, Barbaig, Nyiramba, Sangu and Kimbu.
Singida Mc	2	Nyaturu, Nyiramba
Mkalama	6	Nyiramba, Nyisanzu, Nyaturu, Sukuma, Barbaigs and Hadzabe
Ikungi	3	Nyiramba, Nyaturu, and Sukuma
Itigi	6	Gogo, Taturu, Nyaturu, Sukuma, Nyamwezi and Kimbu

Source: Singida Socio-Economic Profile, 2017

4.7.4 Migration

The Singida region is one of 12 regions in Tanzania that experiences negative net migration out of the 25 mainland regions. Only 8 mainland regions have a positive net migration. In the 2002 Population Census, the Singida region recorded 104,623 in-migrants, and 55,894 out-migrants, resulting in a net migration of -151,271. In the 2012 Population Census, the region counted 149,572 in-migrants, and 261,853 out-migrants, resulting in a net migration of -112,281. This indicates that the number of people moving to live in the Singida Region was increasing compared to those leaving the region, thereby reducing negative net migration. The improvement in social services in the Singida region may have contributed to this decrease in negative net migration.

However, from 2002 to 2012, the average annual intercensal population growth rate was 2.3%, while from 2012 to 2022, it increased to 3.8%. This indicates an improvement in fertility rates, a decrease in mortality rates, growth of economic activities and an increase in migration, leading to changes in the population.

4.7.5 Housing and Ownership

In the Singida region, 49.7 percent of private households used mud and leaves as the main roofing material. Following this, 45.3 percent used iron sheets, 4.6 percent used grass and leaves, and only small percentage used tiles, asbestos, plastic/box, concrete, and paper as their main roofing materials. The usage of iron sheets was more prevalent in urban areas, with 90.6 percent of households using them, compared to rural areas where only 37.6 percent used iron sheets.

According to the Singida Socio-Economic Profile of 2017, about 80.2 percent of households in the Singida Municipal Council used iron sheets, which was a larger proportion compared to other district councils. Additionally, the majority of households in Iramba (61.8 percent), Singida District Council (58.5 percent), and Ikungi (58.1 percent) used mud and leaves as their main roofing materials. The proposed project will lead to an increase in individual income, thereby improving the living housing conditions of the employees of Marwa Marwa and Partner site.

4.7.6 Morbidity Rate

The region experiences a significant health problem, with the top ten diseases affecting a total of 953,760 patients, including both adults and children. According to the Singida Socio-Economic Profile of 2017, common outpatient illnesses in the region include Malaria, Acute Respiratory Infections (ARI), Diarrhea, Eye infections, Pneumonia, Intestinal Worms, Skin diseases, Urinary Tract Infections (UTI), Ear conditions, Clinical AIDS, Typhoid fever, and Genital Discharge Syndrome.

4.8 SOCIAL SERVICES AT THE REGIONAL LEVEL

4.8.1 Energy Supply

According to the Singida Socio-Economic Profile of 2017, TANESCO supplied electricity to a total of 990 households, and the number of households supplied electricity has increased tremendously from year to year. However, out of 255,613 private households in the Singida Region, the most common source of lighting energy was kerosene (wick lamp), used by 45.9 percent of households. Torch/rechargeable lamps were used by 23.6 percent, electricity

(TANESCO) by 10.9 percent, kerosene (lantern/chimney) by 9.7 percent, firewood by 3.8 percent, acetylene gas by 3.3 percent, solar by 1.5 percent, candle by 1.0 percent, generator by 0.2 percent, and biogas by 0.1 percent. Other energy sources such as electricity from wind, biogas, and industrial gas were used to a very minor extent. As for cooking, the majority of private households in the Singida region relied on firewood (82.3 percent), followed by charcoal (13.6 percent), and wood/farm residuals (2.3 percent). Only 0.6 percent of households used modern sources of energy (electricity, gas, and solar energy) for cooking. However, the proposed project will depend on electrict from TANESCO and use a geneartor as a backup power supply in case of a shortage of TANESCO power supply.

4.8.2 Water Supply

In the Singida Region, approximately 38.5 percent of private households had access to an improved drinking water source. Among these households, 4.8 percent had piped water inside their houses, 1.8 percent had piped water in their yard, and 14.1 percent utilized public taps as their main source of drinking water. However, the majority, around 61.7 percent, relied on non-improved water sources. Within this group, 33.4 percent used unprotected dug wells, 11.7 percent relied on unprotected springs, and 14.9 percent utilized surface water from rivers or dams. However, there borehole constructed at the Marwa Marwa and Partner site, which a 60m deep and located 5km away from the site will serve as the primary water source for their mining operations.

4.9 ECONOMIC SERVICES AT REGIONAL LEVEL

4.9.1 Agriculture

Agriculture is the backbone of Singida's economy, with about 90 percent of people relying on it for their livelihood. It makes up over 94 percent of the region's GDP and is done in all its districts. Singida has a lot of land, around 5.8 million hectares, with about 18.9 percent suitable for farming crops. The rest is used for grazing and wildlife reserves. Each district has a different total coverage of land for farming, with Ikungi having the most at 23.5 percent. However not all the farmable land is being used, only about 71.3 percent of the land is used. The main crops grown are sorghum, maize, millet, and sweet potatoes, while cash crops include sunflowers, cotton, and groundnuts. With so many agricultural opportunities in Singida, women can have more income sources besides mining. This will help them grow food and cash crops, improving their living and family conditions while boosting the region's economy.

4.9.2 Livestock Keeping

Indigenous cattle were the most common type of livestock in the Singida region, making up 99.7 percent of all cattle. Improved dairy and beef cattle were much less common, accounting for only 0.2 percent and 0.1 percent, respectively. Most of the cattle were found the in Ikungi district, making up 33 percent of the total cattle population in the region. Manyoni district had the second-highest number at 29 percent, followed by Iramba district at 15 percent. Mkalama, Singida DC, and Singida MC had 11 percent, 9 percent, and 3 percent of the total cattle population, respectively. Apart from cattle, other livestock kept in Singida include goats, sheep, Poultry, donkeys, and pigs.

4.9.3 Forestry

In the Singida region, forest reserves span across seven district councils: Iramba, Singida District Council, Manyoni, Ikungi, Mkalama, Itigi, and Singida MC, covering a total of 278,801.32 hectares. This area represents 0.6 percent of the region's total land area of 49,342,500 hectares. Iramba District Council boasts the largest forest reserve area, with 55,394 hectares, followed by Manyoni District with 49,920.59 hectares. However, Singida MC has the smallest area under forest reserves, totaling 353.25 hectares.

Due to increasing human activities such as deforestation for firewood, charcoal, timber poles, and agriculture, the Singida region has implemented tree-planting initiatives to prevent critical deforestation. A total of 8,532,515 tree seedlings were raised, with Singida District Council leading by raising 4,841,229 seedlings (56.7 percent of the total). Iramba district council followed with 1,603,254 seedlings (18.8 percent), Ikungi district council with 1,239,866 seedlings (14.5 percent), Mkalama district council with 586,283 seedlings (6.8 percent), Manyoni district council with 227,900 seedlings (3 percent), and Singida Municipal raising the least with 33,983 seedlings (0.4 percent).

The proposed project site is located within natural miombo woodland and thicket forest, which are at risk due to local timber harvesting for shaft reinforcement. However, since the proposed project will be carried out within this area, it is essential for Artisanal and Small-scale Gold Miners (ASGMs) in Sambaru to receive education and awareness on forest conservation, as well as access to afforestation and reforestation programs, to conserve the environment, especially considering the poor vegetation situation in most other ASGM mining areas.

4.9.4 Mining sector

The region is rich in gold, with mining activities where the exploitation area spans approximately 2000 square meters. Gold extraction has been ongoing since 2004 under the operation of an independent multinational company, authorized by the Ministry of Minerals and Energy. This mineral resource is spread across various districts within the region, including Ikungi, Iramba, Manyoni, Singida DC, Singida MC, Mkalama, and Itigi. The proposed project has obtained a mining permit and will be conducted within the PML area in Sambaru village.

4.9.5 Infrastructure and Trasport System

Singida's road network spans approximately 6,108.23 kilometers. Trunk roads make up 16.67 percent, covering a distance of 1,018.44 kilometers. Regional roads account for approximately 11.04 percent, totaling 674.2 kilometers, while district/council roads comprise 13.95 percent, with a length of 852.28 kilometers. Feeder roads constitute the largest portion at 50.86 percent, covering a distance of 3,106.46 kilometers, while urban roads make up 7.48 percent, covering 456.85 kilometers.

4.10 DEMOGRAPHIC PROFILES AT THE DISTRICT LEVEL

4.10.1 Administrative Boundaries

The proposed project is in Ikungi District, Mang'onyi ward in Sambaru village. Ikungi district. The council is divided into 4 divisions which are Ikingu, Munghaa, Ihanja, and Sepuka. These divisions are then further sub-divided into 28 Wards, 101 Village council authorities, and 545 sub-villages. Currently, the District Council has two Constituencies namely Singida West and

Singida East. However, Mang'onyi ward is divided into five villages, Mwau, Mang'onyi, Sambaru, Tupendane, and Mlumbi Villages.

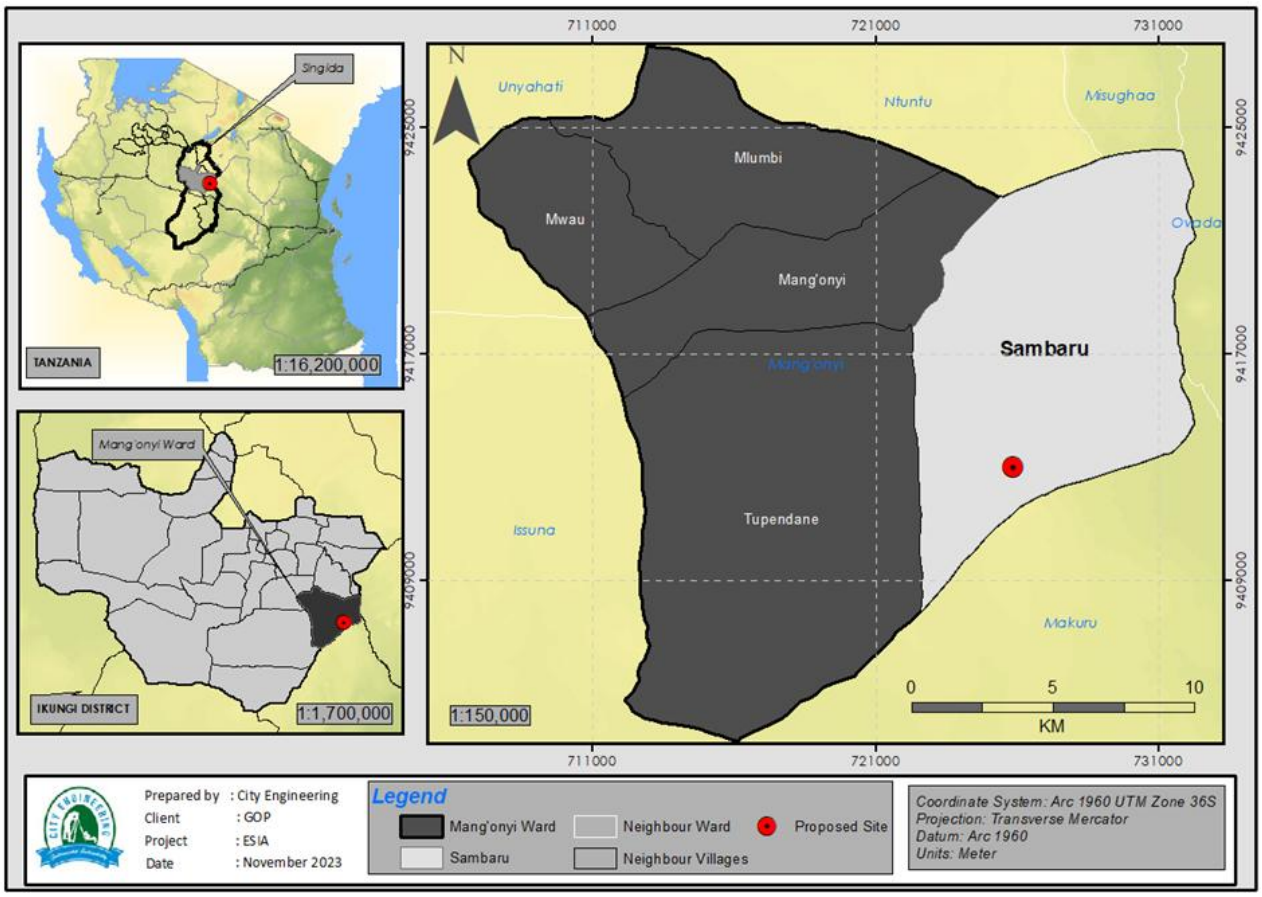


Figure 4-15: Administrative Location of Sambaru Site
Source: City Engineering Company Limited

4.10.2 Population

In Ikungi District, the population was 411,262, with 205,833 females and 205,429 males, residing in 74,527 households. The average household size in the district was 5.5, slightly higher than the regional average. Furthermore, Mang'onyi ward had a population of 22,665, consisting of 11,798 males and 10,867 females, with a sex ratio of 109. There were 4,908 households in the ward, and the average household size was 4.6.

The table below illustrates the population distribution by sex, sex ratio, number of households, and average household size across wards in Ikungi District. These figures highlight demographic variations among wards therefore Understanding these metrics is crucial for effective planning and resource allocation.

Table 4-3: Population Distribution by Sex, Sex Ratio, Number of Households, and Average Household Size by Ward, Kishapu District Council; 2022 PHC

Council/Ward		Population			Sex Ratio	Number of Households	Average Household Size
		Both Sexes	Male	Female			
Ikungi District Council		**411262**	**205429**	**205833**	**100**	**74527**	**5.5**
1.	Mang'onyi	22,665	11,798	10,867	109	4,908	4.6
2.	Ntuntu	14,680	7,397	7,283	102	2,879	5.1
3.	Unyahati	12,088	6,142	5,946	103	2,453	4.9
4.	Issuna	19,281	9,867	9,414	105	3,560	5.4
5.	Misughaa	9,051	4,619	4,432	104	1,799	5.0

4.10.3 Land Area, and Land Use

Ikungi District Council covers a total area of about 8,860 square km which is used for different activities distribution; Agricultural land covers 2,580km^2, Forests and shrubs cover 1,815 km2, Grazing land is 2,887 km2, Water in the form of dams and rivers totals 13 km2, and others 48.3km2. Additional Mang'onyi ward covers a total area of 442.75sq km. The proposal project will be undertaken within PML

4.10.4 Ethnicity and Cultural Heritage

The most dominant ethnic groups in Ikungi are Nyiramba, Sukuma and Nyaturu which are native to Singida, and other migrant tribes such as the Iraq tribe, Chagga, and gogo who have come for business opportunities. No areas of cultural significance were mentioned during the engagement with stakeholders.

4.10.5 Morbidity Rate

The health sector aims at solving the problems of morbidity or sicknesses along with mortality and these are the key targets of any health service development efforts. However, in Ikungi District Council reveals that Acute Respiratory Infections (ARI) and Malaria has become the most commonly cause of morbidity. However, the ten most commonly reported causes of morbidity are Malaria, ARI, Diarrhea disease, Pneumonia, Intestinal worms, Eye conditions, Fractures, Injuries, Skin diseases and others diseases.

4.11 SOCIAL SERVICES AT THE DISTRICT LEVEL

4.11.1 Water Supply

The main source of drinking water in Ikungi District Council, is shallow well (47.1 Percent), followed by surface water 13.5 percent, Public tap/standpipe 13.3 Percent, Protected Drug Well 8.6 Percent, Tube Well/Borehole 5.6 Percent, Unprotected spring 3.7 Percent, Piped water into dwelling 2.9 Percent and other sources. At the proposed project there borehole constructed at the Marwa Marwa and Partner site, with a 60m deep which located 5km away from site will serve as the primary water source for their mining operations.

4.11.2 Health Facilities

The status of public health services in any Council can be easily be visualized through the health infrastructure, availability and commitments of health practitioners, implementation of preventive and curative measures and availability of medicine. Ikungi District Council has a total of 48 dispensaries both privately and government-owned which serves 28 Wards and 101 Villages, in addition, there are 4 health centers and 1 district hospital. These facilities collectively provide essential health services to the community. However, health sector at Ikunngi District faces several challenges including a shortage of medical staff and, a lack of blood transfusion services and x-ray equipment. In many cases, these challenges often lead to patients requiring urgent care being referred to the nearest health facility which is Kiomboi District Hospital.

4.11.3 Education Sector

Education sector in the district level covers Pre-primary, Primary, Secondary and tertiary education which includes also Adult Education (formal and non-formal) and or vocational.

- **Pre-Primary Education**

The Ministry of Education and Vocational Training has set a condition that enrolment of children for school age going in primary education should be for those who would have graduated in pre-primary education. This condition has influenced the expansion of Pre-School mosty government schaols from 102 in 2013 to 108 in 2015. The total enrolment in Public Pre-primary schools has been increasing over the years of which 9,106 in the year 2013. In year 2015 the number of enrolments was 9,340 an increase of 2.6% compared to the previous year where the enrolment difference stood at 243

- **Primary Education**

Ikungi District is a newly council which was established in the year 2013.The district had 102 Primary Schools and the number increased to 108 in the year 2015. Among other factor which delayed the increase of schools is due to private sector participation which is low and has lingered the development of primary education

- **Secondary Education**

Secondary education is a fundamental stage of education stated as constitutional right to every individual citizen in our country and implementation of Millennium Goals in Education. Ikungi District Council has been ensuring provision of secondary education and its improvement through short and long-time plans and annual budgets by establishing, strengthening and improving educational infrastructure and facilities entirely within its borders. Apart from the fact that the development of secondary education in Ikungi district has passed through different challenges due to its historical context and the poor nature of the economy, 35 secondary schools have been established and operating between 2013 to the end of 2015. Among these, 30 are public schools while 5 are non-government schools accommodating about 8,000 to 8,500 students. The district has one public and two private advanced-level secondary schools. The establishment of 30 public schools scattered in all 28 wards in the district has fulfilled the National campaign in equal provision and easy access to all school-aged children by establishing a secondary school in each ward.

- **Adult Education**

Ikungi District Council has made remarkable improvements in the eradication of illiteracy since it was established in 2013. Along with the expansion of primary and secondary education, the Council has also expanded adult education using primary schools as centers and the head teachers becoming in-charge of the adult education campaigns through the various program.

4.11.4 Energy

The electricity network in the district is connected from the National grid through Rural Electrification Agency Project (REA). This provides an additional opportunity to access electricity, especially for the population, and health facilities across the district. Of the total 39 available health facilities only 10 health facilities, which is 26% of the total number of health facilities access electricity from the national electrical grid. In addition, many of the remaining health facilities are equipped with solar current. To date 10 health facilities benefit from solar electricity, equal to 26% of all health facilities.

In Ikungi District the main source of energy for cooking for most of the private households was firewood (89.2 percent) followed by charcoal (9.4 percent), paraffin (0.6 percent), and wood (farm residual) 0.3 percent. The use of modern sources of energy is electricity (0.2 percent), solar energy, and gas (industrial) 0.1 percent each.

4.11.5 Telecommunication

The telecommunication services available in the district are Tanzania Telecommunication Company (TTCL), Vodacom, Zantel, Airtel and TIGO companies. The telecommunication services have now obtained adequate coverage and are therefore accessible at every point of the district. Telecommunication networks have enabled access to fax and internet services. Adequate coverage of the telephone network provides opportunity for the health sector and other sector to strengthen the information system. Sustainable telecommunication networks have a positive effect on consultation, reporting and referral system.

4.11.6 Infrastructure and Trasport System

- **Road Network**

The district has a road network of total lengths of 1,235 kilometers. In addition, only 741 kilometers (60%) is passable throughout the year that includes dry and rain season. However, there is a road extension approaching 86 km which is reinforced with gravel. Extensive district square kilometers, low population density and poor road infrastructure contribute to the high running costs of transport management and communication. This is because during rainy season local transport is hired which are relatively expensive than the public transport. Ikungi district It is accessible from Singida District, Mkalama, and Igunga through the main Singida–Mwanza tarmac highway and accessible from Meatu through feeder all-weather gravel roads.

Table 4-4:Road Network Classification

Road Type	Distance (km)	Conditions
Tarmac	70	
Gravel	86	Good

Earth	1,079	Average
Total	1,235	

Source: Ikungi District Socio-Economic Profile

- **Railway Transport**

Ikungi District Council is fortunate in having the central railway line from Singida to Dodoma which passes through Manyoni District Council under Singida – Manyoni railway line.

4.12 ECONOMIC SERVICES AT THE DISTRICT LEVEL

4.12.1 Agriculture

Agriculture is the back born of the Council economy and about 80 percent of its residents depend on it as their main source of livelihood. Ikungi District Council covers a total area of about 8,860 square km of which it distribution covers Agricultural land covers 2,980 km2, Grazing land is 2,887 km2, Forests and shrubs cover 2703 km2, Water in the form of dams and rivers totals 132 km and others 48.3 km2. Along with that, Ikungi District Council has a total land area of 8,860 km2, which was classified as arable land and therefore suitable for crop farming. The remaining 6280 km of which2,580 km2 were considered to be used for other productive activities such as grazing and game reserves. However, only 50.53 percent of arable land is being utilized for crop production. The major food crops grown in the district include maize, finger millet, sorghum, beans, cassava, Pigeon Peas, rice. Cowpea, lentils, and sweet potatoes also sunflower, cotton, Cowpeas and groundnuts are the main cash crops produced at Ikungi. With so many agricultural opportunities in Ikungi, women can have more income sources besides mining. This will help them grow food and cash crops, improving their living and family conditions while boosting the district economy.

4.12.2 Livestock Keeping

Livestock keeping in Ikungi district council in a large extent practiced traditionally and comprises entirely of indigenous cattle. However, in recent years the residents have developed an interest in dairy cattle for the main purpose of increasing milk production to meet the demand. Dairy cattle owned by individuals outweighed those owned by organizations. The types of livestock kept at large in Ikungi District Council include cattle 554,830(41%), goats 244,451 (18%), sheep 149,010(11%), Dogs 17,233 (1%) pigs 1,239(0.09%), donkey 4,160(0.3%) and Poultry 403,183(29%).

4.12.3 Forestry

The Council has a sustainable plan to demarcate and conserve forest resources in all 24 villages, and this will promote the ongoing beekeeping projects. The village Forest area covers 2703 Hectors currently the total of 46 villages has demarcated forest reserves. The number of tree sedling raised by 26 wards at Ikungi district are 727,930 which aims to conserve the environmental which are mostly impacted by agricultural and Production of charcoal. The proposed project site is located within natural miombo woodland and thicket forest, which are at risk due to local timber harvesting for shaft reinforcement. However, since the proposed project will be carried out within this area, it is essential for Artisanal and Small-scale Gold Miners (ASGMs) in Sambaru to receive education and awareness on forest conservation, as well as

access to afforestation and reforestation programs, to conserve the environment, especially considering the poor vegetation situation in most other ASGM mining areas.

4.12.4 Mining sector

Ikungi District is much endowed with gold as the only mineral being exploited at Londoni village where the exploitation area is estimated to be 2000m. This mineral is being exploited since 2004 with independent multinational company which was given a mining permit with the mother ministry of Mineral and Energy. However there are a reasonable number of small miners around Londoni who are also being engaged to sustain their livelihoods. As the rule of thumb the District is benefiting from the mining exploration by receiving the levy or mineral access with average of 0.3% of the entire value of copper once exported. The district expects the sector to be a more contributor in district economy and boost the income of the small scale miners and enable them to improve their socio-economic services. Therefore, the proposed project has obtained a mining permit and will be conducted within the PML area in Sambaru village.

4.12.5 Financial Services

Ikungi districts have different financial institutions, including CRDB, NMB, and Azania banks, primarily located in the district center. However, in Sambaru village, there are no financial institutions. Instead, mobile money services such as Tigo-Pesa, Airtel Money, M-Pesa, T-Pesa, and Halopesa play a significant role in financial transactions. Notably, the community at small-scale miners, particularly youth, have the privilege of requesting loans of any amount from a fund allocated by the district through the District Community Development Department which is sourced from the Prime Minister's office.

4.13 WASTE MANAGEMENT AND SANITATION

Ikungi District Council does not have a wastewater disposal system. Very few households have septic tanks and the most common way of disposing human waste is through traditional pit latrines. Moreover, with the lack of cesspit emptier and solid waste dump trucks, over-flooding sewage and uncollected garbage pollute the environment of Council headquarters and other townships. At the same time, diarrhea and water-borne diseases are rampant in the Council due to uncollected animal dung and improper covering of human faces during the rainy seasons

4.14 ENVIRONMENT CONSERVATION AND MANAGEMENT

To increase focus on environmental conservation, the Environment Department at LGAs has been split into two, Natural Resources and Environment Conservation, and Solid Waste Management and Cleaning. The Natural Resources and Environmental Conservation Department focuses on conservation efforts mainly tree planting.

4.15 DEMOGRAPHIC PROFILES AT THE WARD AND VILLAGE LEVEL

4.15.1 Population

According to the 2022 National Population and Housing Census, Mang'onyi ward has a total population of 22,665 people in 4,908 households with an average family size of 4.6 and a male-to-female ratio of 100.

4.15.2 Housing and Ownership

The majority of houses in Sambaru village are in normal condition, built with burnt or mud bricks, and topped with iron sheet roofing or thatch. Many guest houses have full-suit iron sheet walls, roofing doors, and windows. Upon inquiry, the team was informed that these are common temporal housing which are constructed on land that is in most cases rented and this temporary structure erected to provide accommodation for the migrant miners. As these are gold rush areas, it is anticipated that eventually when the gold deposits are depleted these communities will leave and go to the next famous gold rush area. The iron sheets can easily be dismantled and taken to the next site. Land (surface rights) ownership is usually from inheritance but also due to demand for mining and other related support e.g. temporal housing for both people and shops direct purchases from residents are done.

4.15.3 Ethnicity and Cultural Heritage

The most dominant ethnic groups in Iramba are Nyeramba, and Nyaturu which are native to Singida, and other migrant tribes such as the Iraq tribe, Chagga, and gogo who have come for business opportunities. No areas of cultural significance were mentioned during the engagement with stakeholders.

4.16 SOCIAL SERVICES AT THE WARD AND VILLAGE LEVEL

4.16.1 Water Supply

The 2012 Population and Housing Census results state that the main source of drinking water in Iramba districts was surface water (river, dam, wells). About 35.6 percent of households used water from improved drinking water sources (piped water, public taps, boreholes, protected wells, and springs. However, there is still a water challenge in the ward because some villages do not have access to clean and safe water

Consequently, at Mang'onyi ward and Sambaru village, boreholes were the main sources. At the proposed project the borehole constructed at the Marwa Marwa and Partner site, which is located 5km away from the site will serve as the primary water source for their mining operations.

4.16.2 Energy

The project area is connected to the National Grid System, and electricity is available in the surrounding areas. The proposed project will utilize grid electricity as its primary source of energy for both construction and operational activities. Within the surrounding communities, electricity access is generally available, with households using grid power mainly for lighting and other basic domestic needs.

Despite the availability of electricity, wood fuel and charcoal remain commonly used sources of energy for cooking and other household purposes in the surrounding areas. These fuels are mainly sourced from nearby forested areas, with fuelwood collection largely undertaken by women.

4.16.3 Telecommunication

In Sambaru village cellular network coverage includes Vodacom, Tigo, Airtel, and Halotel for both voice, messaging, and low bandwidth data. Information is also accessible through TV

and radio. While many residents lack TVs in their homes they can access them through TV halls in the village centre.

4.16.4 Road Network

The project site at Sambaru can be accessed by an all-weather gravel road branching off the main highway at Shelui Center which is about 20 km.

4.17 ECONOMIC SERVICES AT THE WARD AND VILLAGE LEVEL

4.17.1 Agricultural Sector

Crop cultivation is the main economic activity of most residents of Mang'onyi wards. Major crops that are cultivated include maize, beans, sunflower, sorghum, millet, groundnuts, sesame, green peas, and vegetables for both food and cash crops.

4.17.2 Livestock Keeping

Livestock keeping is the second economic activity for the people within the Mang'onyi ward. The main types of livestock are Cattle, Donkeys, goats, sheep, and chickens. The numbers of livestock vary significantly between households. Larger livestock keepers have about 260 heads of cattle while some of the rest of the households in the settlements have about 10 heads of cattle. Chickens are common livestock in almost every household and are kept through a free-range system. Livestock keeping is challenged by frequent disease outbreaks while the bigger challenge is the scarcity of pastures and water for the animals.

4.17.3 Mining

A significant portion of the population in the Mang'onyi ward is directly or indirectly engaged in mining activities, primarily through large mines like SMCL or PML fields. Women play an active role in these activities, particularly in tasks such as crushing and panning. Mining serves as a major source of income for many households within the ward, contributing significantly to their livelihoods. Additionally, artisanal and small-scale mining (ASM) plays a crucial role in providing employment opportunities and supporting local economies within the Mang'onyi ward.

4.17.4 Small Business

Small-scale businesses are prevalent throughout the villages in Mangonyi ward and Sambaru village. These businesses encompass a variety of types, such as retail shops, hair salons, and motorcycle and bicycle repair centers. However, the level of business engagement varies, with Samburu village exhibiting a higher degree of business activity compared to others within the ward.

4.17.5 Financial Services

Ikungi districts have different financial institutions, including CRDB, NMB, and Azania banks, primarily located in the district center. However, in Sambaru village, there are no financial institutions. Instead, mobile money services such as Tigo-Pesa, Airtel Money, M-Pesa, T-Pesa, and Halopesa play a significant role in financial transactions. Notably, the community of small-scale miners, particularly youth, has the privilege of requesting loans of any amount from a fund allocated by the district through the District Community Development Department which is sourced from the Prime Minister's office.

4.18 WASTE MANAGEMENT AND SANITATION

At Sambaru village and the project area, there are no waste collection services and people depend on waste pits within their backyards or haphazardly on land as observed at Marwa Marwa Mining area.

For liquid waste mainly excreta onsite systems consisting of **pit latrine** are included, ensuring sanitation and environmental protection. Once the pits get full they are traditionally emptied by digging a pit beside it. It was reported that due to health education campaigns done by the community leaders, most residents have excreta disposal facilities. Sullage from dishwashing, cleaning, and bathing is mainly directed to the environment outside the homestead.

4.19 ENVIRONMENT CONSERVATION AND MANAGEMENT

In the case of Sambaru, there is no specific conservation plan; however, mature acacia trees were observed to be left standing in various areas not required by human activities which in part contributes to natural regeneration.

4.20 ENVIRONMENTAL SENSITIVITY

The Marwa Marwa and partners site is within natural miombo woodland and thicket forest, which is at risk as timber for reinforcement of shafts is harvested locally. The common timber plant species preferred by ASGM in Sambaru is Brachystegia sp. However, ASGMs in Sambaru stated that they were interested in conservation and would appreciate getting awareness and access to afforestation and reforestation programs, considering the poor situation of vegetation in most other ASGM mining areas. There are no water sources both surface and ground and no culturally significant areas were mentioned by the stakeholders consulted.

Figure 4-17: surrounding Miombo Woodland at the Marwa Marwa and Partners Office

4.21 AGRICULTURE AND LIVESTOCK KEEPING ISSUES, SOCIAL RELATIONS, AND WELFARE OF CHILDREN

Tanzania has devoted substantial resources to promoting gender equality and combating gender-based violence (GBV) and violence against children (VAC). In the project area, gender issues are emphasized, with both genders participating in mining activities, except for women who are mainly hired for hand-crushing gold ore. However, during site visits, occurrences of gender-based violence, such as conflicts among spouses or partners employees, were noted.

5 CHAPTER FIVE: STAKEHOLDER CONSULTATION

5.1 INTRODUCTION

Public consultation and project information disclosure is a comprehensive process carried out throughout the lifespan of a project. it fosters the establishment of strong, positive, and responsive relationships crucial for effectively managing a project's environmental and social risks. Stakeholder engagement at an early stage of project development is particularly effective, as it becomes an essential component of initial project decisions, and is incorporated into the assessment, management, and monitoring of environmental and social risks and impacts of the project

According to WB ESS 10, successful stakeholder engagement can enhance the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and execution.

Therefore, this section outlines the primary stakeholders involved in the project and how their concerns were factored into the project based on WB ESS 10. The broad objective of the stakeholder engagement and involvement process is to provide authorities and interested and affected parties with the opportunity to raise issues, concerns, and opportunities regarding the proposed Project and to address key stakeholders' concerns during the preparation of the Environmental and Social Management Plan (ESMP) for the Project. Furthermore, a comprehensive plan for future actions will be devised through the creation of a Stakeholder Engagement Plan (SEP) for the ESIA report.

5.2 OBJECTIVES OF STAKEHOLDER CONSULTATION

The stakeholder's consultation and engagement process aimed to achieve the following specific objectives as part of the ESIA process as per the requirement of WB ESS 10.

- To identify stakeholders and create a structured approach to engaging stakeholders, to ensure positive relationships with those affected by the project.
- Provide project-related information and materials to affected and interested parties in a timely, understandable, and accessible manner.
- Enhance project acceptance by clarifying project objectives and scope at an early stage and managing stakeholders' expectations
- Assess and mitigate project environmental and social impacts and risks to enhance project benefits
- To provide effective and inclusive means of communication with project-affected parties throughout the projects.
- Provide accessible means for project-affected parties to raise issues and grievances, and respond to them promptly and fairly

5.3 LEGISLATION REQUIREMENT

The stakeholder engagement and consultation processes have been undertaken in compliance with both Tanzanian legislative requirements, and World Bank Environmental and Social Standards. Section 89 of the EMA No. 20 of 2004 emphasizes its importance by guiding

public participation and involvement in the EIA process and states its importance in the EIA. Regulation 17 of the EIA and Audit Regulations 2005 provides further directives and procedures for public participation in the EIA process.

Additionally, WB ESS 10 states that successful stakeholder engagement can enhance the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and execution.

5.4 STAKEHOLDERS CONSULTATION PROCESS

The consultation process is designed to establish an effective platform for productive interaction with the potentially affected parties, disadvantaged groups, and others with an interest in the implementation outcome of the Project. The purpose of the stakeholder engagement plan is to provide meaningful stakeholder engagement throughout the project cycle. The consultation aimed to solicit views, concerns, comments, and inputs from a wide range of stakeholders and project-affected parties regarding project implementation.

5.4.1 Stakeholder Engagement Plan

The consultant developed a Stakeholder Engagement Plan (SEP) to ensure effective engagement with stakeholders at every stage of the project. The consultation aims to gather opinions, concerns, comments, and input from a diverse range of stakeholders. This involved mapping and identification of Interested and Affected Parties, determining the types of information to share with stakeholders, developing effective communication channels and methods to facilitate interaction, and documenting stakeholder feedback, concerns, comments, and suggestions regarding the project.

5.4.2 Stakeholders Identification and Analysis

Stakeholder identification focuses on prioritizing the interests of those affected and interest by the project and evaluating their concerns and areas of interest based on the project's administrative or regulatory jurisdiction. This analysis helps establish the project's scope of influence and determines who should be involved in the consultation for the ESIA study. The consultant identified various organizations, groups, and individuals as stakeholders based on their roles and relevance to the proposed construction of the gold ores washing facilities project. An approach for systematically identifying stakeholder groups was guided by the following:

- Dependency- groups or individuals 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 individuals who will need immediate attention from the proponent concerning social or environmental issues associated with the Project, individuals who may oppose the project, e.g. NGOs.
- Influence groups and individuals who can have an impact on the Project concerning strategic planning or operational decision-making, e.g. LGAs, regulators of various aspects; and

- Diverse perspectives- groups and individuals 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 concerning the Project such as government authorities at different levels (Regional, District, Ward, Village). Table 5-1 below provides a detailed list of stakeholders' engagement at each level in the table below

Table 5-1: List of Project Stakeholders and their roles

Stakeholders Group	Stakeholders	Relevance to the Project
Regulators/Government Agencies/Institutions	Government Chemist Laboratory Agency (GCLA)-Mwanza, Inland Drainage Basin Water Office, Fire and Rescue Services	The Authority deals with permits related to chemical handling, management, and usage; water resources management and pollution prevention; emergency services
Regional Administration	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 Singida Region (Ikungi Districts) DED -District Executive Director District Management Team District Commissioner District Administrative Secretary Heads of Department -DCDO, DEMO, Social welfare, Planning, DMO	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).
Ward Administration	For Singida district (Mangonyi wards) Ward Councilor Ward Development Committee Ward Executive Officers Ward Development committee	Responsible for Ward administration, community development, social welfare, environment, and land management.

Stakeholders Group	Stakeholders	Relevance to the Project
Village Administration	Sambaru village 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, worshipping, and education but could also take part in observing the environment.
Community	Community members at 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 may directly be impacted by the Project, in terms of relinquishing their surface rights for the project, and have the potential to be either economically/physically displacement.

5.4.3 Methodology of Consultation

The consultation was conducted according to the methodologies outlined below, ensuring stakeholders had the chance to voice their opinions on project risks, impacts, and mitigation measures. Furthermore, ongoing engagement with stakeholders will be maintained throughout the project's lifecycle, based on building up effective communication channels.

5.4.4 Notification of Stakeholders

To align with the requirements of the ESCP stakeholders should be notified as early as possible so they can understand the agenda that is going to be discussed and can make it to the meeting venue. The consultation was initiated by sending advance information through phone calls to make appointments with all the stakeholders including the Regional Administrative offices of the Singida Region and Singida District, as well as to ward and village leaders at least a week before the engagement. The phone call not only detailed the program but also requested the aforementioned government leaders to inform their respective committees and community members/villagers about the program and ensure their attendance at the consultation meetings with the consultants. The meeting venue was agreed upon 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

The consultation process was facilitated by the sociologist, and the meetings took place from 11th November to 17th November 2023.

5.4.5 One-to-one meetings

A meeting took place between the consultants and key officials such as the government Chemist Laboratory Agency (GCLA), Inland Drainage Basin Water Office, Fire and Rescue Services and Singida Regional Management Team, Singida Region and Ikungi Districts as follows

- **Regional Level**

A meeting was held on 11th, 2023, at the Singida regional office to present information on the ESIA process and to obtain the Regional administrative leader's opinions about the project. The RC was also informed about the meetings that are to be conducted at the local level with a similar agenda of which the input and concerns provided by the official were duly noted and incorporated into this report

- **District Level**

The meetings were held with the District Commissioner Office (DC, District Executive Directors (DED), and Heads of Departments of Ikungi on November 16, 2023. The ESIA study faced a challenge, especially at Ikungi due to the Regional Commissioner's visiting projects in the district, 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. The discussion included an overview of the project and the ESIA process. Comments and concerns were raised and included in the ESIA

- **Government Agencies**

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

5.4.6 Focus group discussions

The Focus group discussions with the Sambaru ward leaders as well as the ward development committee, Police were conducted as follows;

- **Ward Level and Village Level**

Focus Group Discussions (FGDs) with the Ward Councilor, Ward Executive Officer, and Ward Development Committee (WDC) about the ESIA were conducted on 17th Nov 2023 at Mang'onyi in Samburu village office and another FGD with Village Executive Officers (VEOs), Village Chairpersons, Village Council, Influential, 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, and livelihood activities

Figure 5-1: A FGDs with Ward Development Committee on Mang'onyi ward on 17th November 2023

(Source: CECL Field Study Nov 2023)

5.4.7 Stakeholders' Comments and Concerns

The consultation process carried out in this ESIA has allowed the ESIA team to distinguish the potential community concerns linked with the gold ores washing facilities project. Stakeholders' issues and concerns were documented, encompassing written submissions as well as verbal expressions during focus group discussions and individual meetings. The table below summarizes stakeholder views and perceptions about the likely positive and possible adverse effects of the proposed project

Table 5-2: Record of the Stakeholders' Concerns and Responses

STAKEHOLDER	DATE	PLACE	ISSUE/CONCERN	COMMENT/RECOMMENDATION
GCLA-Mwanza **Chemist** Mr, Boazi Muzari	13/11/2023	GCLA Office	It would be beneficial for NEMC to consider expanding the project's coverage. The initiative should target a larger number of small miners, as, at present, mercury has become similar to an illegal product due to its harmful effects on miners and communities. In the past, there was a well-known mercury distributor in Geita who received proper training on the safe transportation and sale of mercury. However, the situation has now changed, posing greater risks as miners have started to hide when they purchased	This will be the plan for the NEMC since this construction of gold ores and washing facilities under the component of EHMP
Regional Administrative Secretary-RAS Dr. Fatuma Mgaga RAS-Singida region	13/11/2023	RC Office	• NEMC should start a program to provide incentive packages to those who provide information about small miners using mercury without following safety procedures • NEMC needs to consider providing education in the community from one generation to the next about the effects of mercury • NEMC must start the project since they will show the advanced equipment that will minimize the risk of using mercury. • NEMC should also consider providing more training to small miners and implementing a system to capture new small miners or an enrollment system. This way, everyone can receive an education, and it will be easier to understand who does not get an education due to mobility	N/A
Regional Medical Officer (RMO) Singida Dr, Viccorina Ludovick Lucy Kimaro	13/11/2023	RMO Office	• It will support the small miners to understand the best and safety mechanism of handling mercury and other best practice methods • NEMC should create awareness among the community leaders so that they can provide full support during the implementation of the project	N/A
Regional Police Commander - Singida RPC Office	13/11/2023	RPC Office	NEMC should start implementing the project since it will support the small miners to understand the necessary measures to take in their work	N/A

STAKEHOLDER	DATE	PLACE	ISSUE/CONCERN	COMMENT/RECOMMENDATION
ACP, PJ Kayumba				
Regional Fire Officer Singida SR Devotha Bigawa (RFO)	13/11/ 2023	Regional Fire Office	• NEMCs should consider sharing the structure layout with the Fire officer for advice before they start the construction • NEMC needs to consider providing education to the ASGM and the community about safety • As the NEMC project focuses on small-scale miners and communities, it would be beneficial for NEMC to collaborate with the regional fire department to provide additional education on how miners can address workplace emergencies and adhere to safety regulations	The collaboration started and this ESIA survey is also meant to provide stakeholders with sufficient opportunity to engage and provide input and suggestions on the proposed Project;
BWD-Singida Mr, Danford Samson Eng Mwandu Onesmo Head of Water lab	13/11/ 2023	BWD Office	NEMC should continue to collaborate with the water basin office, especially now that it has modern equipment for measuring water quality and its constituents. This will make it easier for the office to provide advice, particularly in mining areas with water-filled pits	Noted
Ikungi District District Commission Beatrice E. Maeda Salum J. Mwalimu	14/11/2023	DC Office DPLO	• While the NEMC project will be beneficial, the project needs to start considering alternative methods to mercury and provide additional education to small-scale miners. • No land conflict have be report the land officer from ASGM • NEMC should start implementing the project since will address most of the challenges of the small miners, and the others will adopt	Firstly, NEMC will construct gold ores and washing facilities to strengthen the institution's capacity to manage and regulate mercury use in Tanzania for small-scale gold miners

STAKEHOLDER	DATE	PLACE	ISSUE/CONCERN	COMMENT/RECOMMENDATION
Ikungi District District Environment Management Officer-DEMO Mr, Jeremiah N. Mkoba Abhiudi Eliamini A	14/11/2023	Ag.DESO Office Ag DMO	• NEMC should establish effective procedures for other miners beyond the project's center to learn from and adopt. • NEMC should develop local expertise to ensure the project's sustainability after completion. • NEMC should also assist the mining office in monitoring the importation of mercury into the country and its use by small-scale miners. • NEMC should involve all safety and security committees, starting at the regional level, to ensure a common understanding and cooperation in project implementation • NEMC shoukd provide education and awareness to the ASGM regarding the use of mercury at least twice per year • NEMC should establish program for ASGM for planting trees to the disturbed area and ensure there are fenced	Noted All the stakeholders from the regional level were engaged in the ESIA study
Ag MOI-Ikungi District Mr, Benard Mtalemwa	14/11/2023	MOI Office	The National Environmental Management Council (NEMC) should collaborate with districts and stakeholders involved in HIV/AIDS projects when initiating a project. This collaboration will help provide additional education to small-scale miners and communities regarding sexually transmitted infections and HIV/AIDS transmission	N/A
DMO Ilkungi District Dr. Abhiudi Eliamini A	14/11/2023	DMO Office	The project will support miners in taking care of their health. NEMC should collaborate closely with the health department to provide additional education to miners regarding issues such as HIV/AIDS and sexually transmitted diseases	N/A
(Ward Executive Office -Mangonyi) Lucas J Mkwama-WEO Mariam A. Chuma-WCDO	15/11/2023	Ward Office	NEMC should start this project as soon as possible since the small miners at Samburu have been waiting for a long time	N/A

STAKEHOLDER	DATE	PLACE	ISSUE/CONCERN	COMMENT/RECOMMENDATION
Grace R. Mmweteni-WAEO				
Village Council, WDC, Influential, religious leaders, and traditional leaders Samburu village Samson S. MwaKaga-VEO Fatuma A. Mwanga VEO Vaileth F. Mushi-Doctor/ physician in charge Happymark T. Abel-Head Master Nyamyanga	15/11/2023	Village Office	• The National Environmental Management Council (NEMC) inspects and grants permits to small miners through a systematic process. NEMC needs to self-evaluate. • NEMC must assess the effective implementation and sustainability of the project after its completion. They should also involve key stakeholders, for instance, in planning the location and how they obtain the Marwa Marwa area. If they had involved the village government, the Village office could have allocated a large area for all miners to benefit and learn from the project, showing the importance of collaboration in decision-making • NEMC should start this project since the 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. • NEMC should have various centres to make it convenient for stakeholders when they need services at their office, and there is a need for additional training for small-scale miners and the community. Currently, NEMC is responsible for collecting fees and providing control numbers	N/A

5.4.8 Reporting and Information Disclosure to Stakeholders

Disclosure and reporting of project information are vital for affected individuals and other stakeholders to understand the risks, impacts, and opportunities linked with the project and are undertaken as part of an ongoing process within stakeholder engagement. Thus, Information disclosure will occur at different stages of the study process. For instance, during the initial site visit, during the site selection and detailed ESIA phases, relevant information will be provided to affected individuals. Further disclosure will occur when the ESIA report is submitted to NEMC, and copies are sent to various stakeholders for their comments. This allows stakeholders to provide feedback and ensure their perspectives are considered. Subsequent disclosure will take place when the report is finalized and submitted to the Vice President's Office (VPO) for approval. At this point, the final report will be shared with various stakeholders, including the Regional Commissioner, Regional Mine Officer, District Council, Inland Basin Water Board, and other relevant administrative institutions, providing them with information and understanding of the issues addressed in the report. Executive summary reports in Kiswahili and English will be prepared and included in the copies to help stakeholders understand the report's contents and mitigation measures and EMP. Furthermore, the report will be accessible through the NEMC online system (**eia.nemc.or.tz**).

5.4.9 Grievance Redress Mechanism (GRM)

5.4.9.1 Grievance

Grievance refers to any dissatisfaction that has the potential to adversely affect organizational relations and productivity. It encompasses concerns or complaints raised by individuals within or outside an organization, highlighting issues that may impact their well-being, rights, or the functioning of the entity.

5.4.9.2 Grievance Mechanism

A grievance mechanism establishes a formalized complaint process that can be utilized by individuals or groups negatively affected by a business, its activities, or operations. This mechanism serves as a structured path for stakeholders, such as employees, local communities, or other parties, to voice their concerns, seek resolution, and ensure that their grievances are addressed in a fair and transparent manner.

5.4.9.3 Grievance Redress Mechanism

The Grievance Redress Mechanism (GRM) is a comprehensive set of arrangements designed to empower local communities, employees, and other stakeholders to express grievances related to the project and seek redress for perceived negative impacts. In the context of project management, especially in endeavors with potential social or environmental implications, the GRM plays a pivotal role. It fosters effective communication, facilitates conflict resolution, and establishes accountability among project stakeholders.

5.4.10 Relevance to the Project

In the proposed gold ore processing and washing facilities project in Mang'onyi ward Smbaru village, the Grievance Redress Mechanism (GRM) holds importance as a pivotal component of project management. It establishes a structured platform enabling stakeholders, including local communities and small-scale miners, to express concerns related to potential social, environmental, or economic impacts arising from the project. The GRM goes beyond by

addressing grievances promptly; it serves as a cornerstone for transparency, inclusivity, and the overall success of the project by actively incorporating diverse perspectives.

Along with that, NEMC will set up a grievance mechanism for the affected community to express their concerns, ensuring it is easily accessible and well-communicated once the project is underway. This mechanism will involve management at the relevant level and promptly address concerns through a transparent process that provides feedback to individuals involved without fear of retaliation. It will not obstruct access to other legal or administrative remedies available under the law or existing settlement procedures, nor will it substitute grievance mechanisms outlined in collective agreements

6 CHAPTER SIX: ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS IDENTIFICATION AND ASSESSMENT

The Environmental and Social (E&S) and screening processes scoped out most of the risks of the projects through 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, especially 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, and water, and impacts to people involved in mining/processing and other land users

6.1 IDENTIFIED IMPACTS

The Impacts Identified during the construction and operations phases are included in Table 6-2 and Table 6-5. These relate to the risks identified in the ESCP. However, as similar activities are undertaken within the vicinity of the project sites the risk level determination is 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 Marwa Marwa site, 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 pleased that activities are ongoing providing them with a source of livelihood and income. The impact due to noise from the operation of the plant is high as the probability is almost certain, the magnitude is high, and the consequences of hearing impairment are permanent.

6.1.2 Employee Health, Safety and Welfare

There are several HSE risks associated with 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 gas emissions; increased

levels of noise; using shared sanitary facilities; sexual interactions amongst workers and the community;

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

Welfare risks 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 chemical emissions/discharge may impact community health.

Project employees interact with community members and transmit STIs and upon project closure abandon families increasing the number of vulnerable groups (single/women and child-headed families)

6.1.4 Impacts on Water Resources

Increased water demand for use in construction, by construction workers and operation of the proposed gold ores processing facility. Both domestic and operational wastewater have the potential to contaminate water sources from inadequate control of stormwater at the site and discharge of wastewater remaining from panning activities.

6.1.5 Generation of Hazardous Waste

Construction waste will contain cement, paints, and specific materials that contain hazards. The use of extraction chemicals e.g. Mercury, Cyanide, and Lime will generate chemically 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 a 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
The extent of impact: spatial limit of the impact	International	Beyond Tanzania's borders
	National	Tanzania
	Regional	Beyond the regional boundaries or watershed

Criteria	Category	Description
	Local	Within the district within Ward/village borders, or at off-site locations (material sources, waste disposal sites, etc.)
	Site-specific	Onsite or within the 100m
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 period 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	The impact lasts several years to and past the 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 period 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

Criteria	Category	Description
	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 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 the foundation and sluice drainage/sediment trap excavations and from working at a 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 leveling of the ground	Probable	Low	Medium-term	Site-specific	Low
	Exposure to loose soil that may wash into waterways and cause siltation	Probable	Low	Medium-term	Site-specific	Low
	Change in drainage patterns	Probable	Low	Medium-term	Site-specific	Low

Phase/Activity	Potential Impact	Probability	Magnitude	Duration	Extent	Risk Level
	Improved biodiversity due to encouraging and planting vegetation	Probable	Low	Medium-term	Site-specific	Low
	Improved aesthetics	Probable	Low	Medium-term	Site-specific	Low
Transit of supplies and project personnel to and from the site	Increased traffic increases the 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 diseases due to the 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 the spread of communicable diseases due to the 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

Phase/Activity	Potential Impact	Probability	Magnitude	Duration	Extent	Risk Level
	Potential for child labor	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
Operation Phase						
Drying of ore	Health and safety risks due to manual heavy lifting	Probable	Low	Medium term	Site specific	Low
	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 mine site 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

Activity	Potential Impact	Likelihood	Magnitude	Duration	Extent	Risk Level
	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
	Generation of tailings	Probable	Low	Medium term	Site specific	Low
Amalgamation	Exposure of employee's elemental mercury by contact	Probable	Medium	Long term	Local	Moderate
	Generation of wastewater 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

Activity	Potential Impact	Likelihood	Magnitude	Duration	Extent	Risk Level
	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
	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 Labor	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 diseases 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 Labor	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

Table 6-4: Decommission Phase Impacts Identified and Their Corresponding Risk Level

Activity	Potential Impact	Likelihood	Magnitude	Duration	Extent	Risk Level
Decommission Phase						
Dismantling of mine and plant infrastructures and 'leveling	• Deterioration in ambient air quality due to dust and particulate matter (PM10 and PM2.5) • 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 uand Lime) which can lead to serious health effects such as neurological and behavioral disorders, kidney damage, respiratory problems, and even death	Probable	Low	Medium- term	Site - Specific	Low
Generation and management of wastes		Probable	Low	Medium- term	Site - Specific	Low
VAT closure activities		Highly Probable	Medium	Long term	Regional	High
Transportation of materials out of site	Accident and Injuries	Probable	Low	Medium- term	Site - Specific	Low
Site levelling and revegetation	Introduction of invasive species	Probable	Low	Medium- term	Site - Specific	Low

Table 6-5: 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
	Generation of sediments that may wash into waterways	Probable	Low	Medium-term	Site-specific	Low
Crushing of ore using hand hammers	Generation of undesirable levels 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 the use of hand hammers	Probable	Medium	Medium-term	Site-specific	Low
	Exposure of children to mine hazards due to being at the mine site with mothers for care	Probable	Medium	Long term	Local	Moderate
Grinding/milling using crushers	Generation of undesirable levels 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

Activity	Potential Impact	Likelihood	Magnitude	Duration	Extent	Risk Level
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 wastewater	Probable	Low	Medium-term	Site-specific	Low
	Generation of tailings	Probable	Low	Medium-term	Site-specific	Low
Amalgamation	Exposure of employee's elemental mercury by contact	Probable	Medium	Long term	Local	Moderate
	Generation of wastewater that contains 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 the 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
	The release of mercury in the air causes 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

Activity	Potential Impact	Likelihood	Magnitude	Duration	Extent	Risk Level
	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
	Exposure of employees to drowning in the VAT tanks	Probable	Low	Medium-term	Site-specific	Low
	Generation of chemical waste 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 diseases due to the 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 the spread of communicable diseases due to the 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

6.3 ALTERNATIVES ANALYSIS

This project aims to promote the 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 a 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.

6.3.1 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 the mercury amalgam without respiratory protection; and dispose of 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 and, the 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 these options support continued health, safety, and environment issues it is not a viable option.

6.3.2 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 labor 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 who have the necessary skills to safely and efficiently operate the 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 a 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 labor force. However, it will eliminate the need for mercury and the associated amalgamation process and burning. This option was found to be viable downstream of the mercury amalgamation process which will be needed to generate the necessary cash for ASGM to access the VAT leaching plants. However, reprocessing of 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.

6.3.3 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, 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 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.

6.3.4 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. To remove this pathway use of retorts has 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 vapour 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 so as not to cause secondary mercury vapours 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 themselves and the associated sand/water is that they can provide a source of secondary pollution when disposed of. However, the benefits of capturing mercury which can be reused (resource recovery) are more favorable 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 the separation of gold/mercury amalgam.

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

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

[6] Guide.pdf (unep.org)

6.4 ALTERNATIVE WATER SOURCES

6.4.1 Rainwater Harvesting

Rainwater harvesting involves collecting and storing rainwater for mining activities, including ore processing, dust suppression, and worker hygiene. This method is environmentally sustainable and helps reduce reliance on local groundwater or surface water sources, particularly in regions prone to water scarcity. However, effective rainwater harvesting requires adequate storage infrastructure, filtration systems, and seasonal planning to ensure continuous supply. Implementing this approach in demonstration centers could showcase its potential benefits to ASG miners and encourage widespread adoption in water-stressed areas.

6.4.2 Groundwater (Boreholes & Wells)

Drilling boreholes or wells provides a reliable and independent water supply for mining operations, reducing competition for surface water resources. This method is particularly useful in areas where rainfall is inconsistent, ensuring a stable source of water for processing activities. However, excessive groundwater extraction can lead to depletion and potential conflicts with local communities. The project should conduct hydrogeological surveys before implementation to assess groundwater availability and sustainability, ensuring responsible water management practices are in place.

The combination of rain harvesting and groundwater will provide alternative approaches that provide practical solutions to enhance the project's sustainability.

6.4.3 Alternative Power Sources

Electricity is primarily sourced from the TANESCO grid, with solar panels and generators as backup options. Solar energy offers a clean, renewable power source for mining operations, especially in remote areas with limited access to electricity grids. By installing solar panels to power mineral processing centers, miners can reduce reliance on fossil fuels, lower operational costs, and minimize carbon emissions. While solar panels require significant upfront investment, they provide long-term savings and energy independence. Battery storage solutions can also be integrated to ensure a continuous power supply, addressing the challenge of intermittent energy production. The project can consider pilot installations of solar power in demonstration centers to assess the feasibility of wider adoption, generators for backup option.

7 CHAPTER SEVEN: IMPACTS MITIGATION AND ENHANCEMENT MEASURES

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

7.1 MITIGATION MEASURES FOR IMPACTS DURING CONSTRUCTION

Several impacts were identified for the construction period a majority of which are pertaining to the 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 work • Provide PPE and enforce usage • Engage HSE Officer as part of the construction crew • Promote good cement handling and limit wasteful practices
	Potential for accidents due to falling in the foundation and sluice drainage/sediment trap excavations and from working at a height	• Demarcate all areas with falling hazards • Provide scaffolding for persons working at a 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 in 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

Phase/Activity	Potential Impact	Proposed Mitigation
		• Identify permitted contractors/persons who can collect and recycle the wastes • Avoid wasteful practices • 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 off 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 to lose soil 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 the drainage
	Change in drainage patters	• Landscape according to the natural topography ensures 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 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
Transit of supplies and project personnel to and from the site	Increased traffic increases the 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

Phase/Activity	Potential Impact	Proposed Mitigation
		• Ensure operators are trained and certified according to the national driving requirements and in addition the project-specific driver training • Liaise with TARURA and install safety signs on community roads
Use of heavy equipment	Potential for hydrocarbon spills	• A contractor will be required to use appropriate fueling equipment with spill-prevention measures when refuelling onsite • Use of plastic drums and mats under heavy
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 the eating area is kept clean and dust bin sealed to discourage vermin infestation
Provision of drinking water	Potential for communicable diseases due to the use of unsafe water supply	Ensure access to adequate amounts of potable water
	Generation of light plastic waste (water bottles)	• Ensure recyclable plastics collection point is available • Engage plastic waste collectors who are operating in Singida town and identify economical means to promote recyclable waste collection
	Increased water demand in community water supply	Consider the provision of bottled water or bulk water supply
Employee hygiene	Potential for the spread of communicable diseases due to the use of unsanitary washrooms	• Provide adequate facilities for sanitary convenience e.g. mobile toilets and mobile septic tanks • Engage cleaners to ensure that they are kept in hygienic conditions • Frequently empty full sewage tanks utilizing permitted contractors •

Phase/Activity	Potential Impact	Proposed Mitigation
Sourcing of labour	Immigration of construction workers	• Adopt principles included in the Labour Management Plan where unskilled workers will be locally 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 contractors and employees, the district authority responsible for labor • Ensure the project and contractor have a grievance mechanism and that employees are aware of it
	Unfair employment terms to Women	• Include adherence to labor requirements in contracts for engaged contractors
	Potential for child labour	• Include adherence to labor 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 the community pertaining to interactions • Ensure the project and contractor have 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 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 labor 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 a 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's exposure to the 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

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 traps prior to discharge
Crushing of ore using hand hammers	Generation of the undesirable level of noise the neighbors 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 the construction crew • Introducing mechanical crusher plants • Apply water as a dust suppressant in mechanical crushers
	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

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

Activity	Potential Impact	Proposed Mitigation
	Exposure of children to mine hazards due to being at the mine site with mothers for care	Liaise with NGOs and the community on the support system for child care while the mother is working
Grinding/milling using crushers	Generation of undesirable levels 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
Supplying power to the crushers	Generation of noise from the onsite generators	• Improve the availability of national grid power • Conduct activities during daytime hours • Provide hearing protection to employees
	Emission of noxious gases from generators	• Improve the 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 the practice of removing sediments and reusing excess water
	Generation of sediment loaded wastewater	• Install sediment traps at discharge sites

Activity	Potential Impact	Proposed Mitigation
	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 the roof
	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 employee's elemental mercury by contact	• Provide hand and respiratory PPE
	Generation of wastewater that contains mercury in the amalgam pool	• Provide training on how to improve the planning process to increase mercury recovery • Reuse water in the amalgamation pool in the panning
	Generation of mercury-laden tailings	• Improve facilities for tailings storage to have cut-off drainage that isolates the tailings from the roof
	Generation of gold that contains mercury as the impurity	• Use retort in the removal of excess mercury from amalgam to promote recapture and reuse
	Promoting continued mercury production and trade	• Investigate increasing efficiency, availability and cost-effectiveness of non-mercury processes • Investigate mechanisms that can provide subsidies 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
	The release of mercury in the air causes pollution	• In cooperation with ASGM investigate how to promote the use of retorts and/or fume hoods. • Enforce regulations mandating the use of retort
	Exposure of employees to mercury aerosols	• In cooperation with ASGM investigate how to promote the use of retorts and/or fume hoods. • Enforce regulations mandating the use of retort

Activity	Potential Impact	Proposed Mitigation
	Generation of ashes that may contain mercury	Improve facilities for ashes storage to have cut-off drainage that isolates the ashes from roundoff
	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)	• Ensure workers receive training prior to commencing work • Provide PPE and enforce usage • Have a chemical handler trained and certified by GCLA
	Generation of mercury and other leaching by-products laden tailings	Remove mercury from tailings obtained from the 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 labor	GCLA in collaboration with MC provides training to ASGM Require ASGM to have formally trained employee in their structure
Provision of food to employees	Generation of food waste	• Discourage food consumption at the site • Provide employees with lunch breaks so they can go and eat elsewhere
	Consuming contaminated food (Mercury/dust) as most eat at their worksite	• Discourage food consumption at the site • Provide employees with lunch breaks so they can go and eat elsewhere
Provision of drinking water	Potential for communicable diseases due to the use of unsafe water supply	Ensure access to adequate amounts of potable water
	Generation of light plastic waste (water bottles)	• Ensure recyclable plastics collection point is available

Activity	Potential Impact	Proposed Mitigation
		• Engage plastic waste collectors who are operating in Singida town and identify economical means to promote recyclable waste collection
	Increased water demand in community water supply	Consider the provision of bottled water or bulk water supply
Employee hygiene	Potential for the spread of communicable diseases due to the use of unsanitary washrooms	• Provide adequate facilities for sanitary convenience • Engage cleaners to ensure that they are kept in hygienic conditions • Frequently empty full sewage tanks utilizing permitted contractors
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 cooperative managers and employees the district authority responsible for labour • Ensure the project and contractor have 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 labor	• Include adherence to labour requirements in contracts for engaged contractors

8 CHAPTER EIGHT: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) outlines measures to manage social and environmental impacts and risks identified during the project's lifecycle. It specifies mitigation actions, demonstrates organizational capacity and resources to implement them, ensures compliance with laws, and aims to minimize negative impacts while enhancing benefits. The responsibility for the implementation of the ESMP is for the project implementor (PIT) NEMC in collaboration with the Mine Commission. Table 8-1 below presents the Environmental and Social Management Plan for the proposed project.

Table 8-1 Environmental and Social Management 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	10,000,000
	Potential for accidents due to falling in the foundation and sluice drainage/sediment trap excavations and from working at a 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 people 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 secure • Identify permitted contractors/persons who can collect and recycle the waste • 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 is common to the floristic region • Use drought resistance and low-maintenance vegetation	HSE Manager	Improved ecology of the area	20,000,000
	Exposure to lose 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	

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	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 the need for care		Restored the ecology of the area	
	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 the 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	• Contractors will be required to use appropriate fueling equipment with spill prevention measures when refueling onsite	& HSE Manager	Zero Spills	3,00,000

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
		• 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			
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	Plant Manager and HSE Manager	Improved hygiene	3,000,000
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	

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
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 • Specialized work will be undertaken by contractors who will be responsible for managing their employees	Plant Manager	Local people employed	NA
	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

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	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 14 to be employed	
SEA/SH awareness	Potential risk of SEA/SH at washing the washing facility	• Maintain active GBV focal people in each mining • Conduct GBV/SEA/SH awareness and sensitization sessions every 3–6 months.	Plant Manager	Zero-tolerance against exploitation of women, including sexual favors	
Transparency	Lack of communication and reporting to grievances	• Maintain active a grievance redress mechanism and reporting and ensure that employees are aware of it • Establish inclusive GRM Committee	Plant Manager	Resolved grievances	
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 gender based violences and implications • Maintain active GBV focal persons at the facility	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 traps prior to discharge		Less or no sediments loosely available	Included in investment cost

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
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	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 • Introducing mechanical crusher plants • Apply water as dust suppressant in mechanical crushers			
	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 childcare 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	

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	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	
	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	
	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	

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
				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	
	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 wastewater that contain mercury in the amalgam pool which could	• Provide training on how to improve panning process to increase mercury recovery		Zero discharge to environment	

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	potentially contaminate sources of water in not disposed according	• 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 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 • 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	NEMC	NA	Included in Investment cost
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 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	
	Exposure of employees to mercury aerosols can lead to serious health effects such as neurological and behavioral disorders, kidney damage,	• In cooperation with ASGM investigate how to promote the use of retorts and/or fume hoods. • Enforce regulations mandating the use of retort			

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	respiratory problems, and even death				
	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 behavioral 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
	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 drown in the VAT tanks	Provide barricade and warning signs at leach tanks		Zero Incident	Already Included
	Generation of chemical waste 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		Trained employees	Already Included

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
		• 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 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 • Engage plastic waste collectors who are operating in Kahama town and identify economical means to promote recyclable waste collection		Recycling of plastic waste	5,000,000
	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

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
	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 employees 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
	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 traps 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					

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
Dismantling of mine and plant infrastructures and 'leveling	• Deterioration in ambient air quality due to dust and particulate matter (PM10 and PM2.5) • 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 disorders, kidney damage, respiratory problems, and even death	• Provision of enough PPEs to all workers onsite and mandate their use • All dismantling activities should be limited in the daytime • Assign qualified supervisors or safety officers to ensure that all safety protocols are being followed	NEMC and HSE Manager	• No incident • Environmental Management (Air Quality Standards,2007)	5,000,000
Generation and management of wastes VAT closure activities		• Timely collection and removal of waste by a certified contractor • Good separation of waste • Proper disposal of hazardous waste through NEMC certified contractor • 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	NEMC and HSE Manager	Zero Discharge	10,000,000

Phase/Activity	Potential Impact	Proposed Mitigation	Responsibility	Target	Cost (TSH)
		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 ● Only qualified personnel should be employed ● Engaging trained and certified drivers to ensure speed control & road safety	NEMC and HSE Manager	Zero incident	Already included
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

9 CHAPTER NINE: ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Environmental monitoring aims to assess the effectiveness of mitigation and management measures implemented in the project 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.

Marwa Marwa and Partners 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 meet the objectives of the ESIA study which are to minimize the adverse impacts of the project 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 be associated 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 TShs 10,500,000/=. Table 9-1 below outlines the monitoring plan for the proposed project.

Table 9-1: Environmental and Social Monitoring Plan

Potential Impacts	Parameter for Monitoring	Frequency	Monitoring Area	Measurement Unit	Target level/ Standard	Estimated Cost per sampling frequency (TZS)
Personal injuries	Record of injuries/accidents/near misses and work-related diseases	Continuous	On-site	OSHA specific units	Zero accident/ incident or injury	1,000,000
Vegetation clearance	Record the number and type of vegetation cleared	During clearance	On-site	Not more than the project footprint	As minimum as possible	1,000,000
Rehabilitation	Vegetation recovery	During dry and wet seasons of the year, twice in a year	On-site	Not more than the project footprint	No Invasive Alien Plant species Only acceptable land use to be practiced Mining Closure completion criteria	1,500,000
Fire explosion	All potential fire sources including electrical appliances and connections such as switches, panel boxes, the Electronic Data Verification System, and other equipment.	As per the Fire and Rescue Service Act	On-site	Service tag	No fire and awareness to all employees and visitors	2,000,000
Increased noise Level	Noise levels	Continuous	Noisy areas/equipment	dBA	85dBA WB EHSGS, residential areas daytime 55 dBA and night time 45 dBA	500,000
Increased level of vibration	Vibration levels	Continuous	Onsite	mm/s PPV	5 mm/s PPV	500,000

Potential Impacts	Parameter for Monitoring	Frequency	Monitoring Area	Measurement Unit	Target level/ Standard	Estimated Cost per sampling frequency (TZS)
Air pollution from emissions and fumes	Emissions of particulate matter, sulfur oxide, nitrogen oxides, fumes, dust, carbon oxides, and any other parameters emitted from the washing facilities and mining operations.	Continuous	Generator, galvanizing, and in emission areas	mg/Nm3	Permissible Weight Concentrations of Emission Limits from the Atmosphere to a Receptor and respective test methods WB EHSGs PM_{10}: 50, $PM_{2.5}$: 25	1,500,000
Alteration of Water Quality	**General Parameters** – pH,EC, TDS, TSS Temp, Fluoride, Alkalinity, Phosphate, Nitrate, Nitrite, Cl, SO4, Ca, Mg, K, Na, Ion Balance Total Metals – Fe, Cr. Dissolved Metals – As, Cd, Cr, Cu, Fe, Hg, Ni, Pb, Sb, Zn.)	After every three months in normal condition	Effluent from the washing facilities	As stated in the Regulations	Permissible limits for Municipal and Industrial effluents	5,000,000
					TOTAL ESTIMATED ANNUAL BUDGET	**10,500,000**

10 CHAPTER TEN: EMERGENCY PREPAREDNESS AND RESPONSE PLAN FOR SAMBARU SINGIDA

10.1 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 manage and respond to emergencies effectively, ensuring the safety and well-being of all miners and associated communities.

10.2 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.

10.3 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.

10.4 EMERGENCY RESPONSE ORGANIZATION

10.4.1 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.

10.5 EMERGENCY SCENARIOS AND RESPONSE PROCEDURES

10.5.1 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. Assembly 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.

10.5.2 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.

10.6 PIT WALL COLLAPSE/LANDSLIDES

10.6.1 Potential Causes

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

10.6.2 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.

10.6.3 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: The** 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.

10.6.4 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.

10.6.5 Mercury Exposure and Poisoning

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.

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.

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

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.

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.

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.

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

Potential Scenarios

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

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.

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.

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.

0.0.10 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.

0.0.11 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.

0.0.12 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.

0.1 TRAINING AND DRILLS

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

0.1.10 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.

0.1.11 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.

0.2 RESOURCE MANAGEMENT

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

0.2.10 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.

0.2.11 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.

0.3 POST-EMERGENCY ACTIONS

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

0.3.10 Incident Assessment

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

0.3.11 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.

0.3.12 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.

0.4 CONCLUSION

This Emergency Preparedness and Response Plan provide 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 CHAPTER ELEVEN: COST-BENEFIT ANALYSIS

0.5 INTRODUCTION

Cost Benefit Analysis serves as a tool for either ranking projects or selecting the most suitable option, relying on anticipated economic costs and benefits. The guiding principle is that a project should proceed if its expected lifetime benefits, encompassing environmental and social aspects, outweigh all anticipated environmental and social costs. Environmental and Social Cost Benefit Analysis (ESCBA) aims to present the lifetime costs and benefits of a project as a single figure, which can be compared against prevailing interest rates or the costs and benefits associated with the environment. Conducting an environmental cost-benefit analysis involves:

- Description of the project and corresponding capital costs.
- Identification of the project consequences in time frame order and obtaining their monetary values.
- Determination of the type of Environmental and Social Cost Benefit Analysis

0.6 PROJECT COSTS

As outlined in Chapter 6, the adverse effects of the gold ore processing and washing facilities project during construction and operation will encompass various aspects such as air quality degradation due to dust and emissions, impacts on water resources, public health concerns, soil contamination, disruption of flora and fauna habitats during construction, generation of solid and liquid waste, noise and vibration pollution, increased risks of HIV/AIDS transmission, safety hazards from site operations, traffic management challenges, water contamination from oil and grease leaks, infrastructure disruptions (e.g., electrical facilities), and socio-economic and cultural disturbances resulting from migration influx.

Assigning a monetary value to each of these negative impacts based on current market rates, employing a combination of market value and payment methods for damages or impacts incurred, or using the cost of remedies such as dust control measures or provision of personal protective equipment (PPE), the total value of these impacts, including management and monitoring costs estimated in Chapter 8 and 9, amounts to approximately One hundred nine million Tanzanian shillings (109,000,000TZS). Determining the market prices or monetary values of environmental negative impacts poses considerable challenges, unlike project costs, as they cannot be readily quantified. Estimates of environmental costs are based on the assumption that these costs are equivalent to the expenses incurred for prevention or remedy measures, such as providing PPE or health insurance, following common industry practices.

0.7 PROJECT BENEFITS

As included in the project rationale in section 1.2, this project will contribute to the increase in gold production operations while reducing environmental and health risks to the surrounding community if the project will cease and all related benefits which are included in Table 11-1 below will not be reaped

Table 11-1: Benefits of Implementing the Project

Item	Amount	Details
Government investment for ASGM to facilitate gold production		The government introduce Gold Ore Processing and Washing Facilities as alternative technologies to mercury for gold recovery in the ASGM as in the year 2020/which 2021. contributed 30% of total gold production (42 tonnes)
Taxes	Include taxes paid over the last financial year	Artisanal and Small-scale Gold Mining (ASGM) significantly contributes to the growth of the national GDP, with many ASGM operations in Ikungi District paying taxes to the Government.
Fees and regulatory charges	Add different fees	Annual fees for OSHA, NEMC, Water
Employment	Insert total number of employees at Marwa Marwa and Partners Site include temporary laborers with % of those coming from the surrounding communities	ASGM in Tanzania contributed about 90% of the total employment in the mining sector and many of this mining is a way of life supporting a variety of livelihoods

0.8 ANALYSIS

By comparing both the tangible and intangible expenses associated with the project, it becomes evident that it will create numerous opportunities for the village, ward, districts, and neighbouring areas, benefiting the entire region and nation as a whole. The project will stimulate increased mining activities, leading to a rapid economic upliftment in the local communities and yielding various advantages. Additionally, the project's operations will generate short-term employment opportunities for the local population, including roles such as construction workers, security personnel, contractors, engineers, and Environmental Impact Assessment teams.

Moreover, the project will result in additional benefits, including tax revenues from construction materials. Hence, the project promises significant economic and environmental advantages compared to the current state of the village and ward. Thus, the benefits expected from the project outweigh the anticipated environmental and social costs over its lifespan.

12 CHAPTER THIRTEEN: CONCEPTUAL DECOMMISSIONING PLAN

The Gold Ore Processing and Washing Facilities is considered as a long-term project aimed at generating economic benefits for the region and country by employing best practices aligned with national and international standards and legislation. This technology is geared towards enhancing the production of gold, thereby minimizing environmental and social impacts and facilitating the rehabilitation process throughout its operational lifespan.

In anticipation of potential decommissioning requirements, this EIA Study considered potential decommissioning impacts that may arise upon the facility's demolition and cessation of operations. Upon completion of the project, NEMC 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 in accordance with Section 37(1) of the EIA and EA Regulations of 2005.

13 CHAPTER FOURTEEN: SUMMARY AND CONCLUSION

The Gold Ore Processing and Washing Facility is located in Sambaru village, Mang'onyi Ward, Ikungi district, Singida Region. It is approximately 35 kilometers south of Singida Town, accessible via the Dar to Mwanza tarmac highway by branching off at Ikungi Centre and then driving about 42 kilometers on an all-weather gravel road to reach the mine. The site is about 7 kilometers away from the Sambaru village center, situated at coordinates (05°18'26.5''S, 35°02'16.9''E).

Based on this project comprehensive management plans have been developed to address potential impacts associated with project activities. Detailed baseline studies have been conducted on the physical, biological, and socio-economic environments to ensure identification and mitigation of all potential Project-related impacts. The project offers significant socio-economic benefits to the proposed area, surrounding communities, Singida Region, and Tanzanian society as a whole. With the exception of the existing mining operation, the project is not expected to produce any significant adverse environmental or social impacts in the area.

The potential impacts identified are manageable through the proposed Environmental and Social Management Plan (ESMP)and take into consideration the Monitoring Plan. NEMC is committed to implementing the project in an environmentally sustainable manner, as evidenced by various activities already undertaken on-site. The proposed environmental management plans aim to ensure project activities are conducted in compliance with the national environmental regulations and internationally accepted best practices.

In summary, the proposed project should proceed as planned, as identified impacts will be effectively managed through implementation of the proposed EMP and Monitoring Plan, allowing realization of the project's benefits.

REFERENCES

- National Land Policy, 1997
- The National Occupational Health and Safety Act (No. 5), 2003
- The National Environmental Policy (NEP), 1997
- The Mineral Policy of Tanzania, 2009
- The National Health Policy, 2003
- The National Water Policy 2002
- The National Policy on HIV/AIDS Policy, 20
- The National Construction Industry Policy, 2003
- The Tanzania Extractive Industries (Transparency and Accountability) Act No. 21 of 2015
- Tanzania Explosives Act,1963
- The Environmental Management Act, 2004.
- Tanzanian Environmental Impact Assessment and Environmental Audit Regulation of 2005 and its Amendment, 2018.
- Water Resources Management Act, (No 11), 2009
- The Mining Act CAP 123
- Mining (Safety, Occupational Health and Environmental Protection) Regulations 2010
- Mining (Environmental Protection for Small Scale Miners) Regulations of 2010
- Employment and Labour Relations Act, 2004
- Industrial and Consumer Chemicals (Management and Control) Regulations, 2020
- Industrial and Consumer Chemicals (management and control) Act 2003
- International Conference on the Great Lakes Regions (ICGLR) Model Law 2012
- World Bank Environmental and Social Standards (ESS) 2018
- Administrative units Population Distribution Report Tanzania Mainland_volume1b
- Ikungi District Socio-Economic Profile 2015

APPENDICES

Stakeholder Engagement Plan (SEP)

STAKEHOLDER ENGAGEMENT PLAN

Project Name	ENVIRONMENTAL IMPACT ASSESSMENT FOR GOLD ORE OPERATION AND WASHING FACILITIES

Project Description	The project aims to conduct an Environmental and Social Impact Assessment (ESIA) for the construction of ASGM gold processing and washing facilities. The aim is to help reduce or eliminate the risks associated with the use of mercury in separating gold from other minerals/materials in the mined ore. The project will propose alternative technologies for ASGM to use in gold production.

Stakeholder Name	Position/Location	Area of Influence	Degree of Engagement	Engagement Approach	Engagement Method	Engagement Frequency
Dr. Fatuma Mgaga	• Singida Regional Commissioner • Regional Administrative Secretary-RAS	• Safety and Accessibility • Regulations and advice regarding resource use and implications at the community level	Interested	Inclusive: Request their input and feedback.	In-Person Meetings, formal letter	Throughout the project life cycle

Stakeholder Name	Position/Location	Area of Influence	Degree of Engagement	Engagement Approach	Engagement Method	Engagement Frequency
Dr, Viccorina Ludovick Lucy Kimaro	Singida Region Medical Officer-RMO Office	The main regulator of the mining sector responsible for all mining activities in the region and ensuring Compliance	Interested	Consultative: Seek their expert	Formal Letters, emails, and In-Person Meetings	Throughout the project life cycle
Dr, Viccorina Ludovick **Lucy Kimaro**	Singida Regional Medical Officer (RMO)	In charge of regional community health and welfare	Interested	Consultative: Seek their expert	Formal Letters, emails, and In-Person Meetings	Throughout the project life cycle
ACP, PS Kayumba	Singida Regional Police Commander - RPC Office	In charge of regional community welfare, safety and security	Interested	Consultative: Seek their expert	Formal Letters, emails, and In-Person Meetings	Throughout the project life cycle
SR Devotha Bigawa	Singida Regional Fire Officer (RFO)	In charge of regional community welfare, safety, security, and rescue	Interested	Consultative: Seek their expert	Formal Letters, emails, and In-Person Meetings	Throughout the project life cycle

Stakeholder Name	Position/Location	Area of Influence	Degree of Engagement	Engagement Approach	Engagement Method	Engagement Frequency
Ikungi District District Commission Beatrice E. Maeda	District Executive Director-DED Geita	Responsible for the district administration, Safety, and Accessibility of community development	Interested	Consultative: Seek their expert	Formal Letters, emails, and In-Person Meetings	Throughout the project life cycle
Mr, Jeremiah Kahurananga	Ikungi District District Environment Management Officer-DEMO	The district environmental management	Interested	Consultative: Seek their expert	Formal Letters, emails, and In-Person Meetings	Throughout the project life cycle
Salum J. Mwalimu	District Planning and Land Officer	Responsible for land	Interested	Consultative: Seek their expert	Formal Letters, emails, and	Interested
Mr, Danford Samson Eng Mwandu Onesmo	Lake Tanganyika BWB	Water resources management and providing different permits related to the project	Interested	Consultative: Seek their expert	Formal Letters, emails, and In-Person Meetings	Throughout the project life cycle

Stakeholder Name	Position/Location	Area of Influence	Degree of Engagement	Engagement Approach	Engagement Method	Engagement Frequency
Head of Water lab						
Mr, Boazi Muzari	GCLA Office - Mwanza Chemist	The Authority deals with permits related to chemical handling, management, and usage; water resources management and pollution prevention; emergency services	Interested	Consultative: Seek their expert	Formal Letters, emails, and In-Person Meetings	Throughout the project life cycle
Mr, Benard Mtalemwa	Ikungi District Ag MOI- MOI Office	In charge of district community welfare and health	Interested	Consultative: Seek their expert	Formal Letters, emails, and In-Person Meetings	Throughout the project life cycle
Dr. Abhiudi Eliamini A	Ilkungi District Medical Officer-DMO Office	In charge of district community welfare and health	Interested	Consultative: Seek their expert	Formal Letters, emails, and	Interested
Lucas J Mkwama- Mariam A. Chuma	Mang'onyi Ward Office – WEO, WDC, WCDO, WAEO	• Responsible for Ward administration, community development, social welfare, environment, and land management.	Affected	Engaged: collect their input	Formal Letters, and In-Person Meetings/FGD	Throughout the project life cycle

Stakeholder Name	Position/Location	Area of Influence	Degree of Engagement	Engagement Approach	Engagement Method	Engagement Frequency
Grace R. Mmweteni		• The affected communities in the project area				
Samson S. MwaKaga-VEO Fatuma A. Mwanga VEO Vaileth F. Mushi-Happymark T. Abel-Head Master Nyamyanga	Samburu Village-Village Executive Office-VEO Council, WDC, Influential, religious leaders, traditional leaders, Doctor/ physician in charge	Responsible for community safety, and security	Affected	Engaged: collect their input	Formal Letters, and In-Person Meetings	Throughout the project life cycle