PREPARED BY

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MADINI HEALTH NETWORK

FIELD OBSERVATIONS REPORT

OSIRI-MATANDA GOLD MINING AREA, MIGORI COUNTY, KENYA

INTEGRATED OCCUPATIONAL AND ENVIRONMENTAL HEALTH ASSESSMENT OF ARTISANAL AND SMALL-SCALE GOLD MINING (ASGM) OPERATIONS

EXECUTIVE SUMMARY

Madini Health Network (MHN) conducted a field assessment of artisanal and small-scale gold mining (ASGM) operations in Osiri-Matanda, Migori County, to characterize occupational and environmental health risks affecting miners, nearby communities, and vulnerable populations.

The assessment involved recording field observations on silica dust exposure, observations on mercury handling practices, waste management, wastewater disposal, environmental contamination, community exposure, and occupational safety.

Field observations indicate that miners face multiple overlapping hazards arising from drilling, blasting, ore crushing, milling, amalgamation, and mineral processing. Equally concerning is the close interaction between mining activities and residential settlements, raising broader public health concerns extending beyond the workforce.

The observations presented in this report are intended to inform county government agencies, mining cooperatives, public health institutions, environmental regulators, development partners, and researchers in designing integrated interventions for safer and more sustainable ASGM operations.

1. BACKGROUND

Artisanal and small-scale gold mining remains an important livelihood for thousands of households in Migori County. Despite its economic contribution, ASGM is frequently associated with occupational hazards and environmental degradation resulting from informal mining and processing practices.

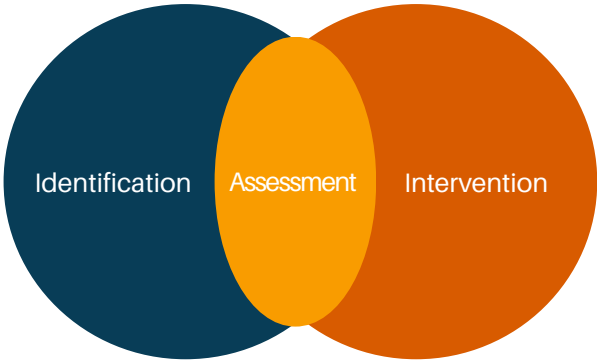
Historically, interventions have focused on individual hazards such as mercury or mine safety. However, field observations demonstrate that miners are simultaneously exposed to multiple occupational and environmental risks that interact to increase disease burden.

This assessment therefore adopted a broader Occupational and Environmental Health perspective.

2. OBJECTIVES

The field assessment sought to:

- Identify major occupational hazards within ASGM operations.
- Characterize environmental pathways for contaminant exposure.
- Document waste management practices.
- Assess community exposure to mining activities.
- Identify opportunities for practical interventions.
- Inform future exposure assessment and policy development.



3. METHODOLOGY

The assessment consisted of:

- Direct field observations
- Site walkthroughs
- Discussions with miners and site operators
- Photographic documentation
- Preliminary hazard identification

The assessment focused on identifying observable risk factors rather than conducting laboratory confirmation of contaminants.

4. SUMMARY OF MAJOR FINDINGS

FINDING 1: EXTREMELY HIGH SILICA DUST EXPOSURE

Large quantities of visible dust were generated during:

- Blasting
- Crushing
- Dry grinding
- Ball milling
- Ore transportation

Most dust-generating processes were undertaken without effective engineering controls. Workers frequently operated in dense dust clouds with minimal respiratory protection.
Potential health outcomes include:

- Silicosis
- Tuberculosis
- Chronic obstructive pulmonary disease
- Lung cancer

FINDING 2: LIMITED ENGINEERING CONTROLS

The assessment found widespread reliance on dry processing methods.
Observed deficiencies included:

- Limited wet crushing
- Limited water spray systems
- Poor dust containment
- Minimal ventilation
- Lack of localized dust suppression

Engineering controls remain the most effective strategy for reducing respirable silica exposure.

FINDING 3: MERCURY USE AND CHEMICAL EXPOSURE

Processing infrastructure suggests the likely use of wet mineral concentration methods that may involve mercury amalgamation. Open settling ponds containing processing slurry were observed throughout processing areas.
Priority questions include:

- Whether mercury is routinely used
- Where amalgamation occurs
- Where amalgam burning occurs
- Whether mercury is recovered for reuse
- The extent of environmental contamination

Future laboratory analyses of:

- wastewater,
- tailings,
- sediments,
- and surrounding soils

are strongly recommended.

FINDING 4: POOR TAILINGS AND SOLID WASTE MANAGEMENT

Large volumes of mine waste were stored in extensive uncovered heaps adjacent to processing areas and residential settlements.
The waste consisted of:

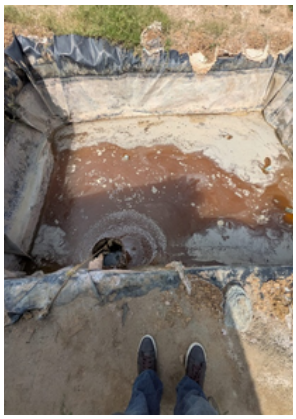
- waste rock,
- processed tailings,
- discarded sacks,
- plastic bottles,
- domestic refuse.

These heaps create several potential hazards:

- dust generation,
- unstable slopes,
- chemical leaching,
- uncontrolled runoff.

Where mercury is used, tailings may become long-term contaminant reservoirs.

FINDING 5: WASTEWATER MANAGEMENT



Multiple open settling ponds containing process water were observed.
Potential concerns include:

- suspended solids,
- heavy metals,
- residual processing chemicals,
- mercury (where used).

Although settling ponds reduce suspended particles, they do not necessarily eliminate dissolved contaminants.
Without engineered containment systems, contaminants may migrate into nearby soils and drainage systems.

FINDING 6: SOIL CONTAMINATION

Processing activities occur directly on exposed ground.
Repeated discharge of slurry and processing residues may allow contaminants to accumulate in surrounding soils over extended periods.
These contaminated soils may later become secondary exposure sources through:

- windblown dust,
- direct contact,
- children's play,
- stormwater runoff,
- future agricultural use.

Soil contamination should therefore be included in future environmental assessments.

FINDING 7: COMMUNITY EXPOSURE

Mining and mineral processing occur immediately adjacent to residential settlements.
Residents living near processing areas may be exposed to:

- respirable silica,
- environmental dust,
- excessive noise,
- contaminated runoff,
- mercury vapour (where amalgam burning occurs).

Occupational health therefore extends into a broader environmental public health issue.

FINDING 8: VULNERABLE POPULATIONS

The field assessment identified mining activities occurring in close proximity to community infrastructure, including a primary school.
Although precise distances require GPS verification, this observation raises concern regarding chronic exposure among children.
Children are particularly susceptible to:

- silica dust,
- heavy metals,
- excessive noise,
- accidental injury.

This issue warrants urgent investigation.

FINDING 9: NOISE POLLUTION

Continuous exposure to:

- crushing,
- milling,
- drilling,
- blasting

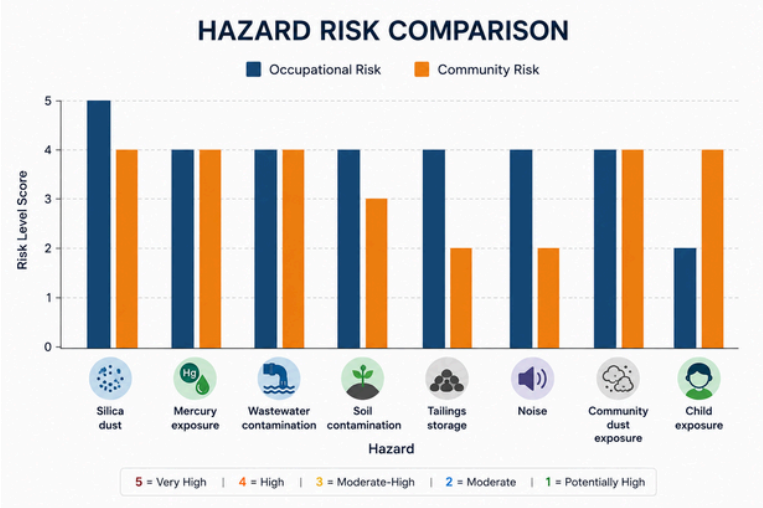
creates substantial occupational noise exposure.
Potential impacts include:

- hearing loss,
- reduced communication,
- fatigue,
- increased accident risk.

Nearby residents may also experience chronic environmental noise.

OVERALL RISK ASSESSMENT

Hazard	Occupational Risk	Community Risk
Silica dust	Very High	High
Mercury exposure	Potentially High	Potentially High
Wastewater contamination	High	High
Soil contamination	High	Moderate–High
Tailings storage	High	Moderate
Noise	High	Moderate
Community dust exposure	High	High
Child exposure	Moderate	High



PRIORITY RECOMMENDATIONS

Immediate (0–6 months)

- Conduct silica and mercury awareness campaigns.
- Introduce approved respiratory protection.
- Promote wet drilling, wet crushing and wet milling.
- Improve housekeeping around processing areas.
- Prevent open disposal of processing waste.
- Delineate hazardous processing areas.
- Restrict children's access to processing sites.
- Establish basic wastewater containment measures.

Short-Term (6–18 months)

- Conduct air monitoring for respirable crystalline silica.
- Monitor mercury exposure among miners.
- Characterize tailings.
- Test wastewater quality.
- Assess soil contamination.
- Conduct noise monitoring.
- Map proximity of mines to schools and residential areas.
- Develop cooperative-level environmental management plans

Medium-Term (18-36 months)

- Introduce engineered dust suppression systems.
- Establish safer mercury management practices.
- Develop centralized tailings management.
- Improve wastewater treatment.
- Strengthen occupational health surveillance.
- Establish routine environmental monitoring.

Long-Term

Support development of an integrated County ASGM Occupational and Environmental Health Program involving:

- County Department of Health
- County Department of Mining
- National Environment Management Authority (NEMA)
- Directorate of Occupational Safety and Health Services (DOSHS)
- Ministry of Mining, Blue Economy and Maritime Affairs
- Mining Cooperatives
- Universities and Research Institutions
- Development Partners

RESEARCH PRIORITIES

Future work should include:

- Personal silica exposure monitoring
- Mercury biomonitoring
- Soil sampling
- Tailings characterization
- Wastewater analysis
- Surface water monitoring
- Noise assessment
- Air quality monitoring
- GIS mapping of exposure pathways
- Community health surveillance

CONCLUSION

The Osiri–Matanda field assessment demonstrates that occupational and environmental health risks in artisanal and small-scale gold mining are interconnected and extend well beyond silica dust exposure. Miners experience simultaneous exposure to respirable dust, hazardous noise, and potentially hazardous processing chemicals, while surrounding communities may also face environmental risks arising from tailings, wastewater, and the close proximity of mining activities to homes and schools.

These observations underscore the need for a coordinated, multidisciplinary response that integrates occupational health, environmental protection, public health, and sustainable mining practices. While laboratory analyses are required to confirm the presence and extent of contaminants such as mercury, the precautionary principle supports immediate implementation of practical risk-reduction measures. Strengthening engineering controls, improving waste management, enhancing exposure monitoring, and protecting vulnerable populations should be prioritized.

Madini Health Network is currently working with technical partners and other stakeholders to develop a cooperative-led occupational health awareness program to serve as the building block for a comprehensive occupational and environmental health strategy for ASGM.