

# Exploring the fate of mercury in artisanal gold mining in Tanzania

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## Background

Indiscriminate use of mercury during gold extraction subjects human being and the environment to contamination

Mercury emission in Africa, is ~ 330 metric tons/year (UNEP, 2013). Major emitters are Ghana, Sudan, **Tanzania**, and Burkina Faso. ASGM accounts for more than 70% of the emissions. In Tanzania, ASGM is the major source of mercury.

WHO, (2003), recommends investigation of foods total Hg intake. However, contamination of fish by methyl-Hg is specially of concern worldwide.

In Tanzania, it is important to investigate the contribution of ASGM activities to mercury levels in water, suspended particulate matter, sediments, and fish.

## STUDY JUSTIFICATION

All artisanal mines in Tanzania use mercury for gold recovery. Meanwhile, there has been steady increase in the number of people engaged in artisanal and small-scale gold mining (ASGM). Mdee, (2015) estimated 76 artisanal and small scale gold mines employing between 0.5 and 1.5 million people, thus, widespread release of mercury (Hg).

Mercury contamination has been detected in mining sites. It is transported through atmospheric and riverine processes (Kim and Zoh, 2012; Tungaraza, et al., 2011). Population in artisanal gold mining are at high risk of Chronic or acute poisoning.

In **Tanzania**, there is no routine monitoring and protection against mercury. Levels of mercury and environmental consequences; to the physical environment and biota are not certainly predictable.

The fate and distribution of different species of mercury in the mining areas and beyond need to be identified.



Figure 2. Open-air mercury handling.

## MATERIALS AND METHODS

**Target group:** ASGM (artisanal and small-scale miners). Sampling at three mining sites, Mugusu and Nyarugusu (life time of over 40 years) and one site in the southern highlands.

**Sample types:** sediments, water and biota. Fish samples. Quantification of mercury in mines and connected environment e.g. farms, water sources, L. Victoria.

**Sampling:** A core-grab and stainless steel shovel used for sediment sampling from shallow waters of rivers and Lake Victoria. Sampling points at upstream and downstream of the mining sites near rivers, e.g. Mgusu mine.

**Laboratory analyses:** THg and Me-Hg. Samples; sediment, fish and water.

**Atmospheric modeling:** Quantitative estimation of mercury emission and deposition from ASGM activities to be developed by the HYSPLIT-Hg model. Will also include simulated mercury transport downwind, wet and dry deposition.

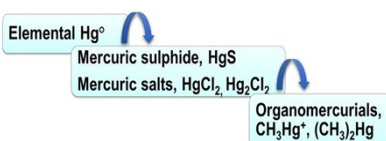


Figure 1. Typical mining sites turned to permanent settlement.

Table 1. Recent survey observed chemical characteristics of mining sites.

Sample ID	[Hg] ng/L = ppb	Site/sample description
Mgusu mine Point 1	846.38	Point 1 spring water for community Point 2 – 3 downstream points along the river
Mgusu mine point 2	1,814.71	
Mgusu mine point 3	2,120.12	
Nungwe Bay pint 1	1849.86	Point 1; 4 km downstream from mining site, Rice farm
Nungwe Bay point 2	1,975.52	Point 2; 4 km downstream from Mgusu mine, Rice farm
Nyarugusu mine	1,307.72	Rice farm, old mining site
Mgongo mine	3,927.78	Water from residue. central region
Londoni mine	2,794.17	Recycled water from gold extraction, central region

## EXPECTED OUTPUTS

**Capacity Building:** Two masters students trained and Laboratory capacity to analyze THg and Me-Hg enhanced;.

**Environmental benefits:** Spatial and temporal mercury distribution presented including mercury speciation; Quantitative inventory of mercury use established; Policy maker informed of mercury status in the environment.

**Social benefits:** Safety and security of vulnerable group exposed and documented; Food safety against mercury to be established.



Figure 3. Ecological restoration by planting Phragmites

## Preliminary observations

- ❖ Mercury contamination covers large area in mining sites.
- ❖ Mining environment (soil/dust water sources and air(?)) contaminated by mercury
- ❖ There is no cautious use of mercury
- ❖ Mining sites turned to permanent settlements
- ❖ Ecological restoration initiatives not solving mercury disposal problem

## REFERENCES

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