Minamata COP 4.1. side event

Sound management of mercury-containing tailings in Artisanal and Small-Scale Gold Mining

3 NOVEMBER 2021
11 AM - NOON (CET)

UN environment programme 50 1972-2022

MINAMATA CONVENTION ON MERCURY

GLOBAL MERCURY PARTNERSHIP

AGENDA

NAP guidance document update in relation to ASGM tailings management

Global Mercury Partnership lead

Best practices and recommendations for management of ASGM tailings

Malgorzata Stylo, UNEP

Managing ASGM tailings in **Zimbabwe** national experience sharing

Christopher Mushava, Environmental Management Agency of Zimbabwe

Removing mercury from tailings experience from **Colombia**

Alfonso Rodriguez, Pure Earth Colombia

Moderated by Kenneth Davis, UNEP

NAP guidance document update in relation to ASGM tailings management

Global Mercury Partnership

3 November 2021 - Minamata COP 4.1. side event – Sound management of mercury-containing tailings in ASGM

TAILINGS

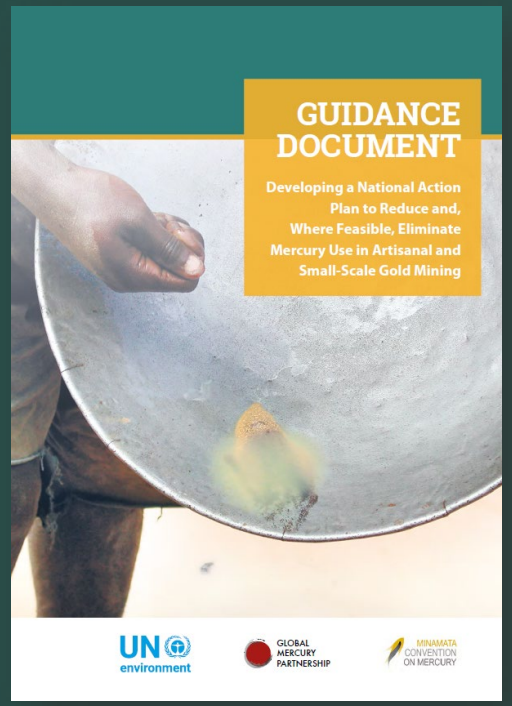
The waste material left over after a portion of the valuable components have been removed from the ore (dependant of the processing technology).

Due to inefficiencies in ore processing, some ASGM tailings contain significant amounts of unrecovered gold.

Cyanide leaching of tailings to which mercury has been added without first removing the mercury is one of the worst practices as defined by Annex C of the Minamata Convention.

It leads to generation of mercury-cyanide complexes that are highly mobile in the environment and bioavailable.

MINAMATA CONVENTION ON MERCURY



The Third Conference of the Parties of the Minamata Convention requested the Secretariat, in cooperation with the Global Mercury Partnership, to **improve the guidance on the preparation of national action plans for ASGM** regarding **management of tailings** from such mining.

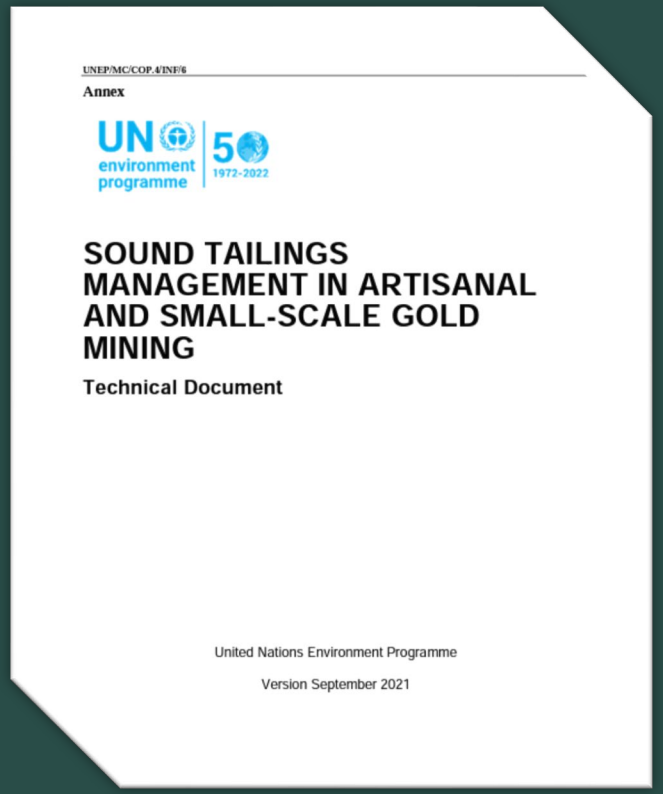
Updates to NAP guidance document submitted for COP 4 consideration (COP.4/6)

Available at:
https://www.mercuryconvention.org/en/documents/article-7-artisanal-and-small-scale-gold-mining-update-guidance-document-preparation

MINAMATA CONVENTION ON MERCURY

GLOBAL MERCURY PARTNERSHIP

UN environment programme 50 1972-2022


UNEP/MC/COP.4/INF/6

Annex

UN environment programme 50 1972-2022

SOUND TAILINGS MANAGEMENT IN ARTISANAL AND SMALL-SCALE GOLD MINING

Technical Document

United Nations Environment Programme

Version September 2021

To further guide the Parties in their efforts to soundly manage ASGM tailings, UNEP in collaboration with the Minamata Secretariat and Global Mercury Partnership developed a **complementary technical document**, highlighting best practices for ASGM tailings management (COP.4/INF/6).

Available at: https://www.mercuryconvention.org/en/documents/guidance-document-management-artisanal-and-small-scale-gold-mining-tailings

Best practices and recommendations for management of ASGM tailings

Malgorzata Stylo, UNEP

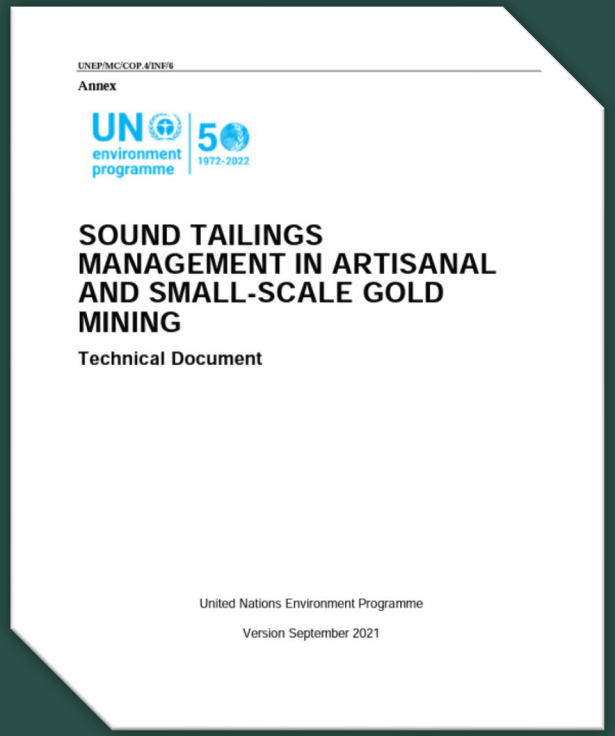
3 November 2021 - Minamata COP 4.1. side event – Sound management of mercury-containing tailings in ASGM

Best practices and recommendations for management of ASGM tailings

MINAMATA CONVENTION ON MERCURY

GLOBAL MERCURY PARTNERSHIP

UN environment programme 50 1972-2022


UNEP/MC/COP.4/INF/6

Annex

UN environment programme 50 1972-2022

SOUND TAILINGS MANAGEMENT IN ARTISANAL AND SMALL-SCALE GOLD MINING

Technical Document

United Nations Environment Programme

Version September 2021

- BASICS OF TAILINGS MANAGEMENT
- MERCURY AND GOLD RECOVERY FROM TAILINGS
- DISPOSAL, ECOLOGICAL RESTORATION AND MONITORING OF MERCURY CONTAINING TAILINGS
- LEGAL ASPECTS AND GOVERNANCE
- PROVIDING INFORMATION AND ENGAGING COMMUNITIES

BASICS OF TAILINGS MANAGEMENT

The best way to manage mercury-containing tailings is **not to generate them in the first place**

Keep mercury-contaminated tailings **separate**

Understand the local political, socio-economic, and environmental **context**

Measure **mercury content** and perform additional **chemical and mineralogical characterization** of tailings

MERCURY AND GOLD RECOVERY FROM TAILINGS

Never apply **cyanide to mercury**-contaminated tailings

Ensure **safe disposal** of the recovered mercury

Prior to reprocessing of mercury-contaminated tailings, **mercury must first be removed**

Cyanide should only be used by **organized and trained miners** that can comply with chemical management

DISPOSAL OF MERCURY CONTAINING TAILINGS

Do **not use mercury contaminated material** to construct tailings structures

Mark and fence the tailings' structures

Ensure **safe transport** of tailings

Use **impermeable lining** systems or concrete and cover tailings

Ensure tailings structures are constructed **away from human settlements**, grazing and farming areas, rivers and outside flood areas

Do **not to dump the tailings** that contain mercury back into streams or in flood-prone areas

ECOLOGICAL RESTORATION OF MERCURY CONTAINING TAILINGS

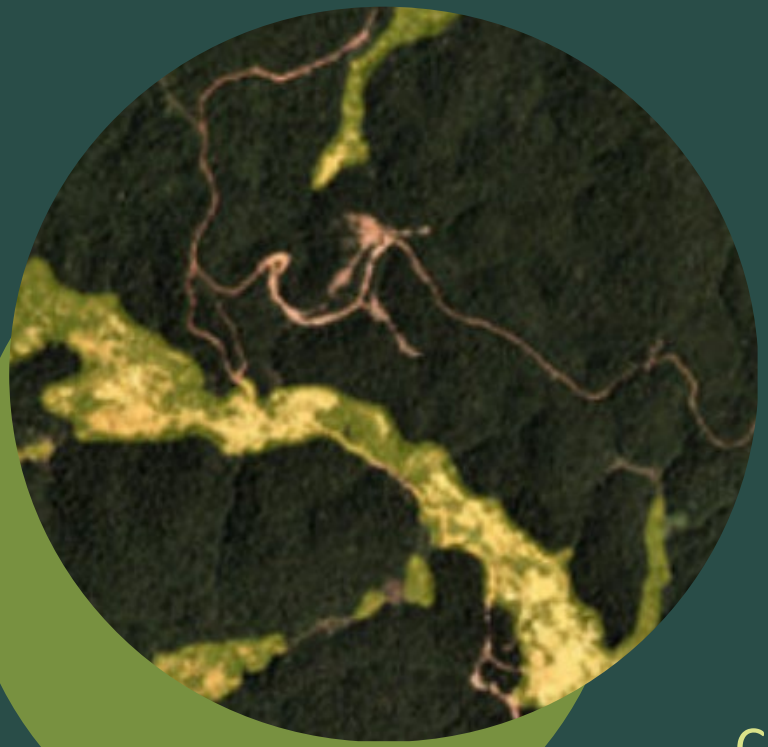
Restore the surface grading and **revegetate** the land to reduce erosion

Engage ASGM communities in the restoration plans

Consult Art 12 of the Minamata Convention if the land is **contaminated** with mercury

Organize **educational sessions** focused on the benefits of restoration and future restored land use possibilities

MONITORING OF MERCURY CONTAINING TAILINGS



Consider using **remote sensing** to identify and **track progress** of the existing tailings

Consider using **geospatial tools**, e.g. GIS, to keep **track of the locations and characteristics** of mercury containing tailings

Consider **periodic sampling** and characterization of the tailings to monitor changes

LEGAL ASPECTS AND GOVERNANCE

Ensure **miners participation** and build interventions on the formalization efforts

Review legal and regulatory frameworks to identify gaps and propose improvements in respect to tailings management

Allocate **financial mechanisms and responsibilities** to ensure the sound management of tailings

PROVIDING INFORMATION AND ENGAGING COMMUNITIES

Inform the community about the presence of mercury-contaminates tailings and the associated risk

Disseminate information about mercury pollution and **mitigation programs** in affected communities

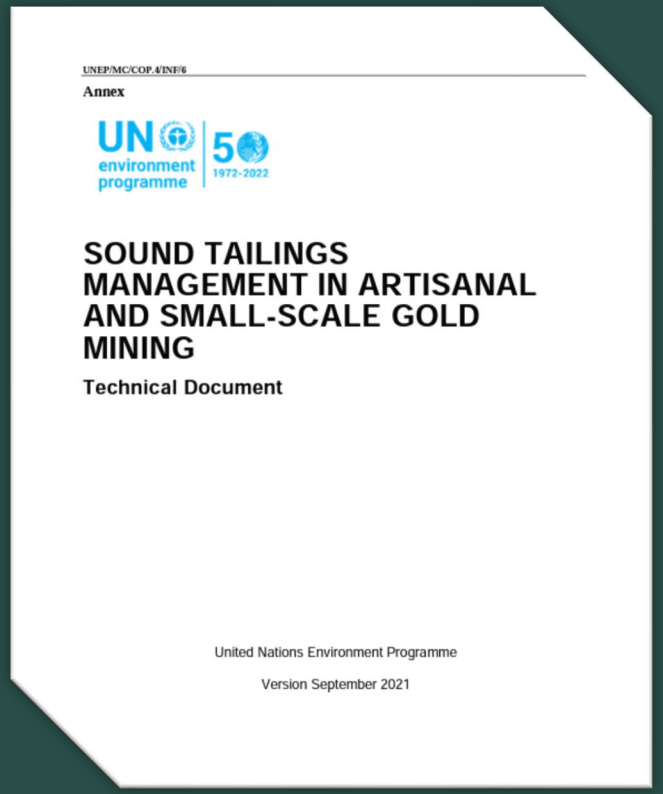
Design and conduct **educational programs**

Ensure the engagement of indigenous populations

MINAMATA CONVENTION ON MERCURY

GLOBAL MERCURY PARTNERSHIP

UN environment programme 50 1972-2022



UNEP/MC/COP.4/INF/6

Annex

UN environment programme 50 1972-2022

SOUND TAILINGS MANAGEMENT IN ARTISANAL AND SMALL-SCALE GOLD MINING

Technical Document

United Nations Environment Programme

Version September 2021

Available at: https://www.mercuryconvention.org/en/documents/guidance-document-management-artisanal-and-small-scale-gold-mining-tailings

Contact: malgorzata.stylo@un.org

Managing ASGM tailings in Zimbabwe

Christopher Mushava, Environmental Management Agency

3 November 2021 - Minamata COP 4.1. side event – Sound management of mercury-containing tailings in ASGM

ASGM TAILINGS-ZIMBABWEAN CASE

C. MUSHAVA

Director Environmental Protection

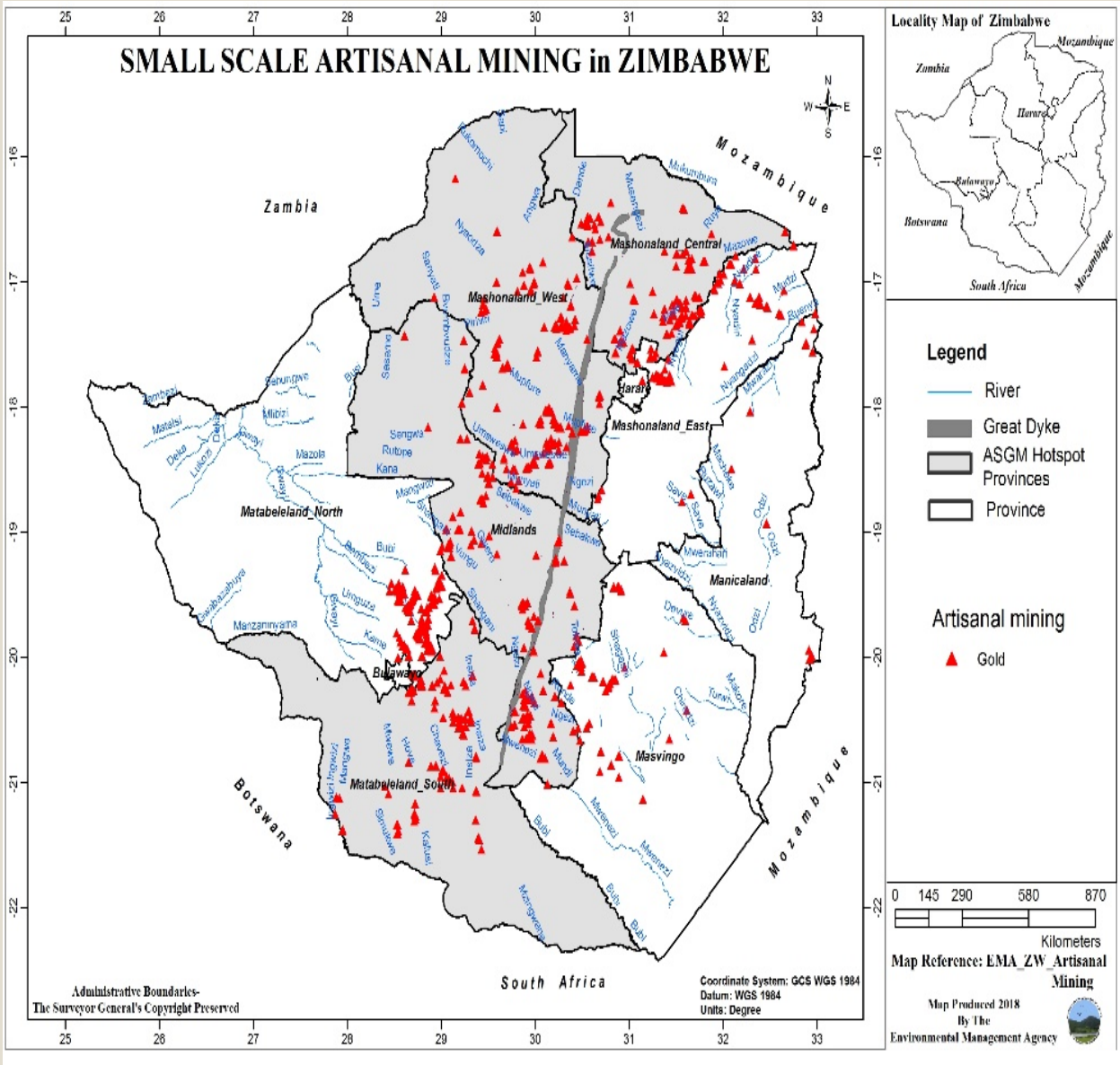
Environmental Management Agency

Presentation Outline

- **Background**
- **Challenges in tailings management**
- **Interventions**
- **Areas for further improvement**

Background

- Zimbabwe has a significant number of ASSM number well over 1.5 million direct participants.
- This has become a source of livelihoods for a number of families, women and youths included.
- All the ASGM miners use mercury for gold amalgamation
- Gold extraction from ore using the mercury amalgamation process is predominantly done on concentrates after milling and gravity separation.
- The management of tailings remain cause for concern.
- The disposal of tailings is done under a license and all gold processing Activities in Zimbabwe are regarded prescribed.
- Due to the illegal and migratory of ASSM, regulating is often times ineffective.



Challenges in Tailings Management

- Cyanidation of mercury rich tailings still being done by the majority of miners.
- Unavailability of low cost Tailings Storage Facility Designs
- The Tailings Storage Facilities are not properly constructed resulting in erosion and pollution of land and water courses.
- Cropping up of mobile hummer mills and mobile vat-leach tanks where tailings are generated.

TSF Challenges IN THE ASGM SECTOR

Emerging Issues: Use of Hammer Mills& Gold Detectors

Interventions

- Creation central custom milling plants for ASGMs.
- Awareness is ongoing on the dangers of tailings mismanagement and the effect of cyanidation of Mercury Rich Tailings.
- Creation of mercury free prototype

Interventions

- Inspections done on quarterly bases and miners are required to carry out analysis of their tailings.
- EMA developed a standard checklist of EIA issues that are being used by ASGMs
- Coordination mechanism and collaboration was established through NAP eg on resettlement of ASGM communities.

Interventions

- EMA is working on a model TSF for ASGMs with minimum requirements
- Treatment of contaminated sites and demolition of some illegal site which posed threats to communities
- Government created a loan facility of Small scale miners

Areas For Improvement

- Funding to finalize the development of TSF suited for ASGM as well as construction of a demonstration TSF.
- Assistance with equipment e.g simple water pumps so that they move away from water courses.
- So far there is one gold centre and one Prototype mercury free technology. There in need for funding to role out more Projects and upscale. More need to be
- Researched eg on dam siltation and mercury in fish and sediments.
- Complete formalisation of the ASGM Sector
- Creation of more prototypes mercury free technology demonstration centres and gold centres.

Thank You

Removing mercury from tailings – experience from Colombia

Alfonso Rodriguez, Pure Earth Colombia

3 November 2021 - Minamata COP 4.1. side event – Sound management of mercury-containing tailings in ASGM

Promoting Responsible Recovery and Handling of Mercury from Contaminated Artisanal Gold Mining Tailings in Colombia

November 3rd - 2021

PURE EARTH
BLACKSMITH INSTITUTE

Alfonso Rodríguez

Country Director - Colombia
arodriguez@pureearth.org

Expected Results & Pillars

- Understand which mercury-recovery technologies are most applicable to the Colombian context.
- Develop a model for the responsible and profitable recovery of mercury and gold from tailings, and
- Develop and adopt recommendations for technical protocols for the safe handling, storage and disposal of recovered mercury that considers local, regional and national contexts

El ambiente es de todos Minambiente

MINMINAS

Current situation of contaminated tailings in Colombia

Piles

Sacks

Tailing Pool

Relevant aspects evidenced

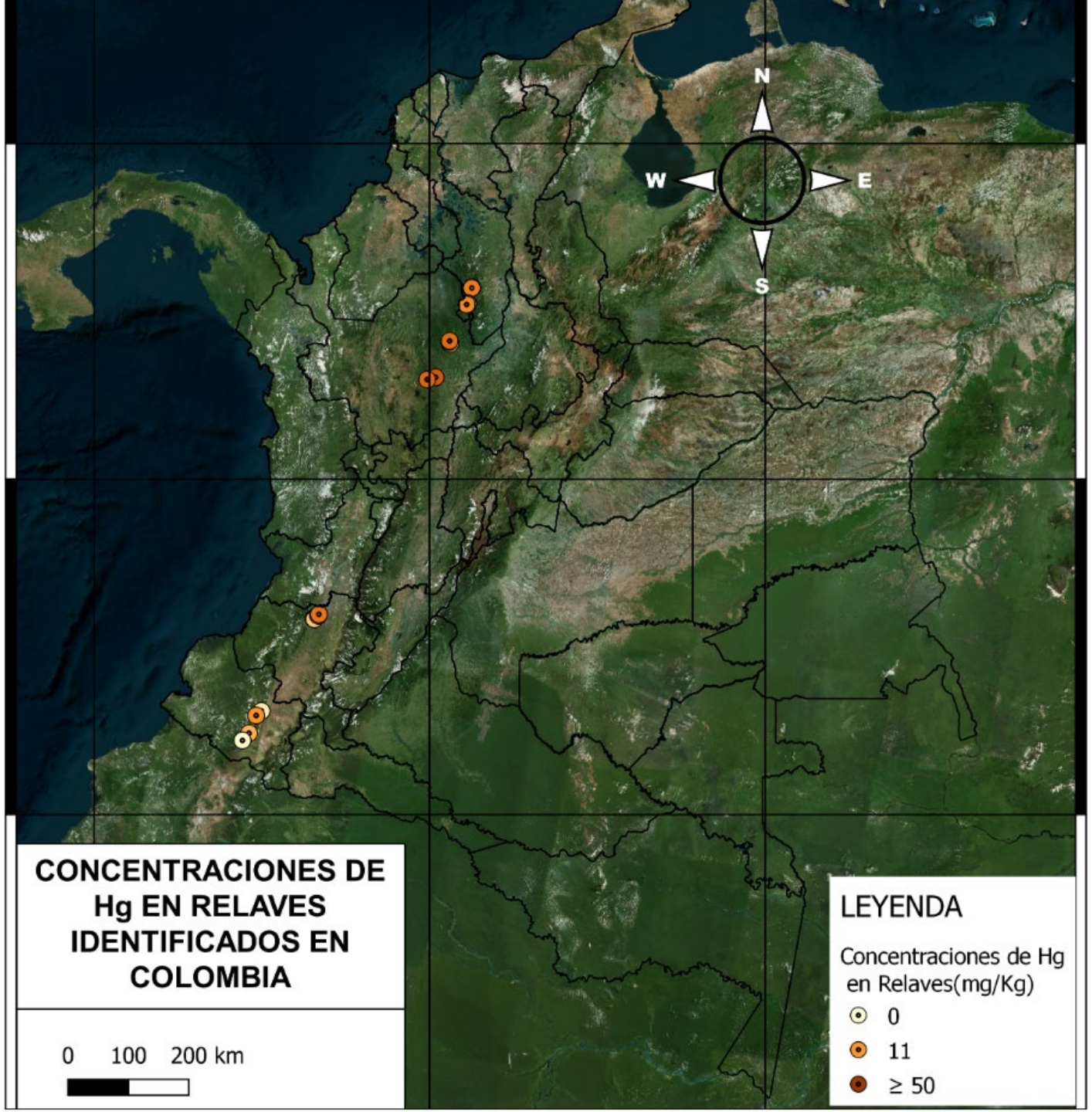
- Originated mostly by illegal mining
- High concentration of total mercury (speciation of mercury is in process)
- Representative concentration of residual gold (Problem Cyanidation process+ Mercury)
- New alternative of business for small miners
- An option to increase the gold production in Colombia (Ministry of Mining intention)
- There is no control regulation (Overlapping of responsibilities between Min Environment Vs Min Mining)
- Dilemma in considering tailings as hazardous waste

Tailings Characterization

Pistola - XRF

HERMES

JEROME



PURE EARTH
BLACKSMITH INSTITUTE

UNDP

planetGOLD

Tailings Hg Concentration Colombia

PURE EARTH
BLACKSMITH INSTITUTE

UNDP

planetGOLD

Tailings
Au Concentration
Colombia

Copper plates

Objetive

Test the effectiveness of retention of mercury by using silver - copper plates technology in ASGM contaminated tailings at pilot scale.

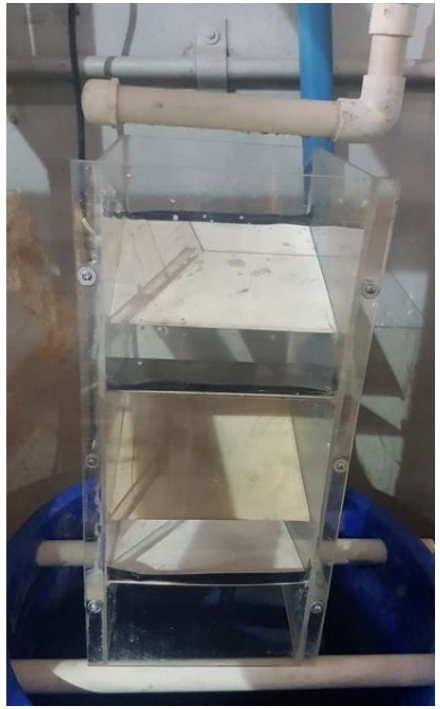
Electroplating process

- Each plate size is 30 x 30 cm
- 3 millimeters thick
- Creation of grooves on the surfaces of the plates
- 6 silver-copper plates per treatment
- 5.400 cm ^{2} contact area

$$AgNO_3 + NaCN \rightarrow [Ag(CN)] + NaNO_3$$

$$AgNO_3 + 2NaCN \rightarrow Na[Ag(CN)_2] + NaNO_3$$

Using Copper Plates to Recovery Mercury From Tailings Progress



Lab Test
November 2019

Pilot Test Phase I
March 2020

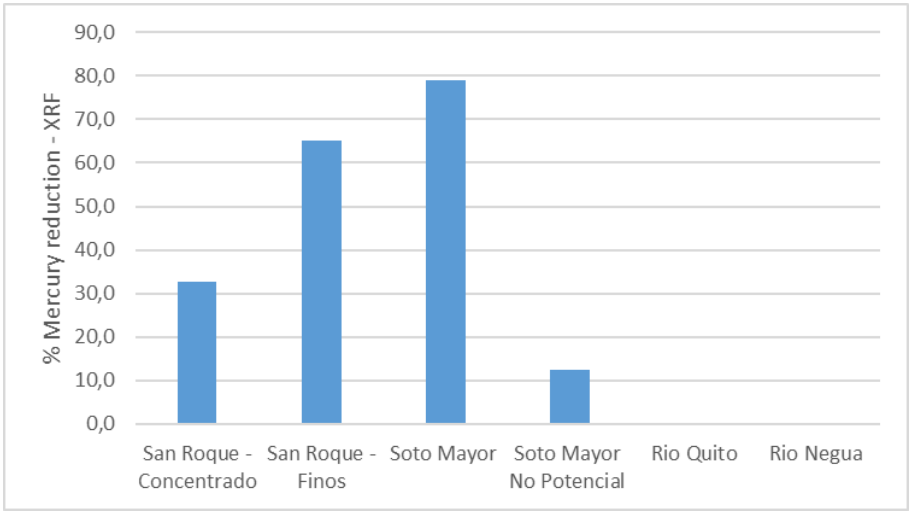
Pilot Test Phase II
October 2020

Pilot Test Phase III
May 2021

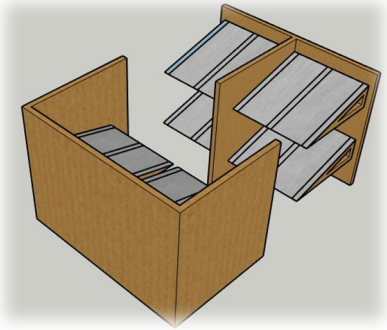
Copper plates Lab Test

(November 2019)

- Plate positioning (Slope 20 - 30%)
- Tailings solution flow (30% Solids)
- 3 Kg of processing per tailings
- up to 79% reduction in mercury under ideal conditions

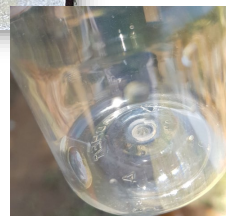


Copper plates
Pilot Test Phase I
(March 2020)



- Initial design of the support the position of the plates
- 3 different types of tailings (ages)
- Average of 6 ton processing per tailings
- Up to 83 % reduction in mercury under ideal conditions

Copper plates
Pilot Test Phase II
(October 2020)



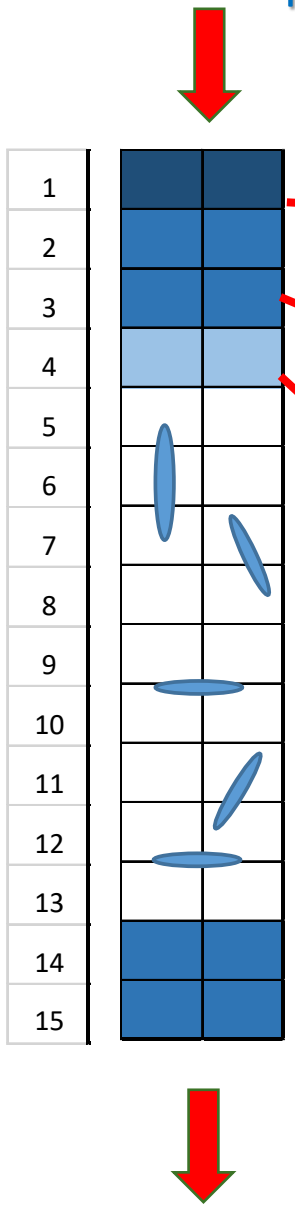
- Improvement of the positioning of the plates
- 5 different types of tailings (ages)
- Average of 8 ton processing per tailings
- Liquid mercury was recovery with the use of shaking table.
- Up to 70 % reduction in mercury

Copper plates
Pilot Test Phase III
(May 2021)

- 30 copper plates in series
- 5 different types of tailings (ages)
- Average of 8 ton processing per tailings
- Increase in residence time and surface area of contact between the tailings and the plates
- Up to 50 % reduction in mercury

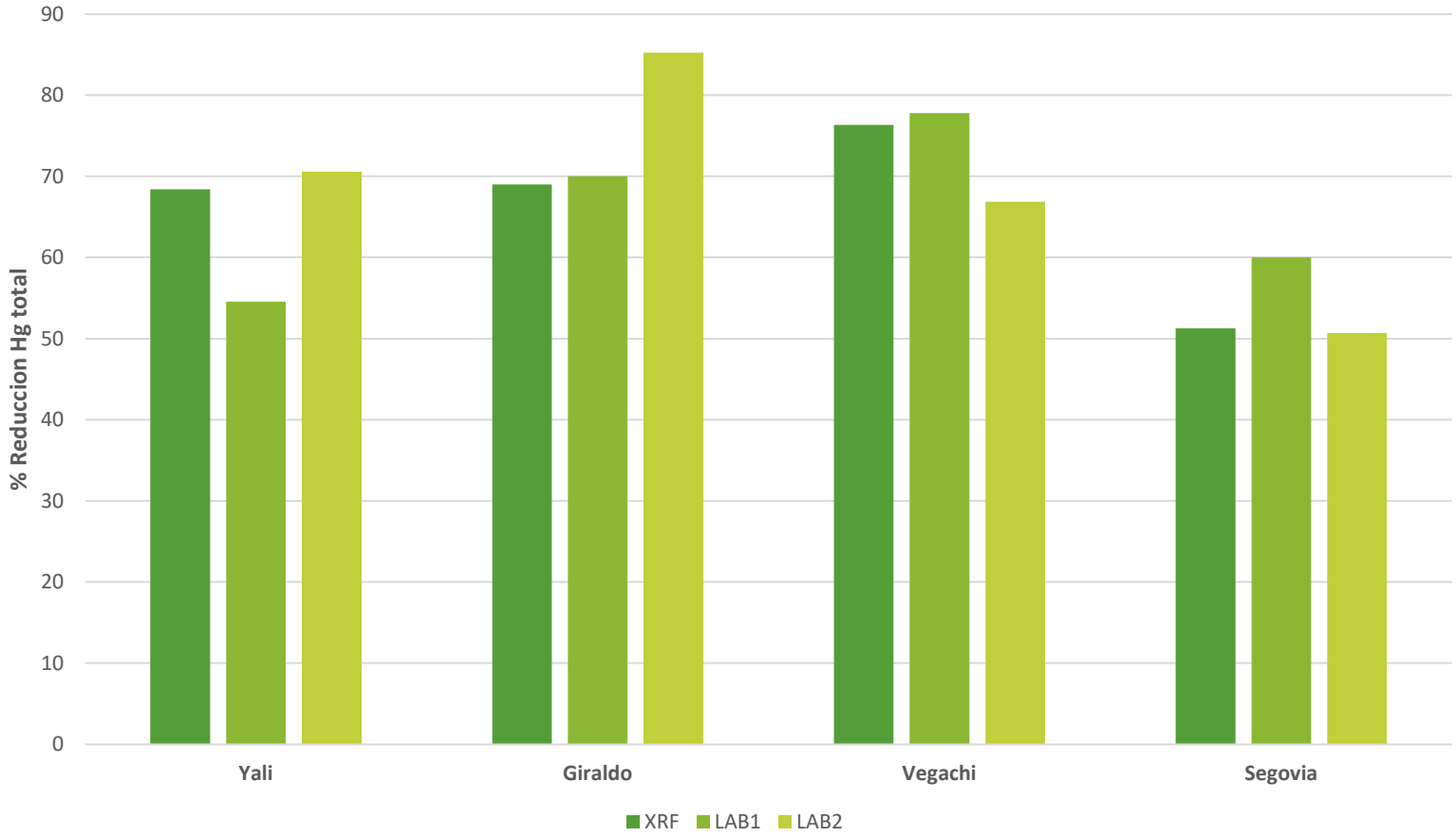
Pilot Test Phase III

Mercury capture scheme from copper plates



Pilot Test Phase II

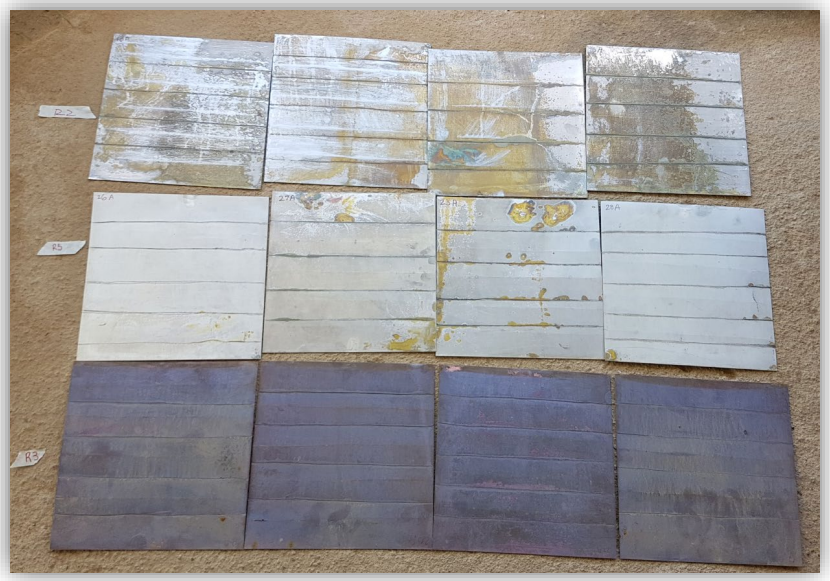
- Total mercury recovery



Copper plates
Relevant Aspects - Conclusions

- The effectiveness of mercury recovery from tailings can be positively affected by physical pretreatment of the tailings (Shaking table)
- The mineralogical distribution of the tailings has a low influence on the mercury recovery process with the copper plates
- The lifetime of copper plates is a variable that is still under study

- Mercury recovery is affected by tailings age of more than 3 years



Thank You

Alfonso Rodríguez
Country Director - Colombia
arodriguez@pureearth.org

PURE EARTH
BLACKSMITH INSTITUTE

Questions
Answers

Thank you for you attention

For more information visit UNEP Global Mercury Partnership website