Building Partnerships for Research and Training
Roadmap to Responsible Gold in Guyana

Project Purpose

In collaboration with the Guyanese government, mining associations, educational institutions, and the private sector, this project aims to enhance existing national strategies to build a legal, professional, and mercury-free ASGM sector in the country. The project is developing and field-testing tools required to bridge the gap between the status quo of small-scale gold mining and the needs of responsible investors who can finance improvements to the sector at greater scales.

By the Numbers

3

Key stakeholder partnerships in development

1

Memorandum of Understanding** under review with the **Guyana Women Miners Organisation

1

Press Release** currently under review for project endorsement from the **Ministry of Natural Resources

8

*Key **mining operations** under review for site assessments in the fall and **1 partnership developed** with miners*

Key Achievements

The project has been focused on building partnerships and collaborative models with key stakeholders in the Guyana ASGM sector for 2023. At present, the Ministry of Natural Resources and the Guyana Gold Mining Commission are reviewing a joint press release which details the Government of Guyana's endorsement for the project. As well, one MoU has been drafted and is under review between the AGC and the Guyana Women Miners Organisation, who plan to collaborate together to bring women miners into capacity-building activities related to mercury-free processing and business planning related to access to finance. In addition to this, the AGC has begun discussions with the Environmental Protection Agency and the Pesticides and Toxic Chemicals Control Board to discuss mercury storage and flows in the context of the Minamata Convention on Mercury's requirements and the AGC's guidance. Lastly, several mining sites have been selected for assessment this fall.

Guyanese alluvial miners using hydraulic jets to pump gold bearing sediment through a sluice, create a concentrate, apply mercury, and produce the gold. | Kevin Telmer

Supports ENV Mercury Goals

- ❑ **Goal 1** – Reduce the use of mercury in ASGM through partnerships, education, and better technology.

The Team

The Artisanal Gold Council is a non-profit organization based in Victoria, Canada which focuses on professionalizing and formalizing the ASGM sector globally.

Tegan Holmes, **Project Manager**

Vasquez Ramdas, **National Project Coordinator**

Fundamental strengths of PNG

Reducing Mercury Use in Papua New Guinea's ASGM Sector

Project Purpose

In collaboration with the government of Papua New Guinea and ASGM miners, the goal of this project is to prepare PNG to reduce the use of mercury in artisanal and small-scale gold mining (ASGM) through developing a mercury inventory, key parameters database, an outreach program on mercury free processing including a module on health impacts, and performing research on the trade of mercury and gold. Information on basic aspects of the sector, including the level of gold production and amount of mercury being used in PNG is equivalent or better than many other countries, but remains imperfect. This information is required to design, budget, implement and monitor effective mercury control measures and effective gold mining regulation and gold trade. Fortunately, and contrary to broad perception, the PNG government has a deep understanding and high level of expertise in ASGM. It has a professional technical and regulatory agency (MRA) that is dedicated to providing service to the ASGM sector. It directly receives 0.5% of the value of exported ASGM gold. This project's purpose, therefore, is being accomplished by scaling up the existing fundamental strengths of PNG's ASGM regulators (MRA, BPNG, CEPA) and to augment them with new knowledge about mercury.

By the Numbers

2
Working Groups established

3
Reports published including ASGM inventory workplan, and trade reports

3
Health Publications for trainers and miners

Mercury Free nugget production at semi-mechanized operation, Nov 2022, Bulolo, PNG

Sponge gold produced with mercury from manual operations, November 2022, Wau, PNG

Key Achievements

One key achievement for all parties, including the government itself, is a clear recognition that the PNG government has a deep understanding and high level of expertise in ASGM. The MRA provides technical services and regulates mining leases, including performing site visits. The BPNG overseas financial regulation, issues export licenses, collects royalties, creates refining and pricing policy for exports, creates foreign exchange policy relating to gold exports. MRA directly receives 0.5% of the value of exported ASGM gold. This direct financial support underpins consistent planning and program delivery which has led to good relations with the ASGM communities. Regarding **Mercury**, it is broadly used but not always, particularly when gold is coarse or when nuggets are first collected. This means that only part of the gold produced in PNG is done so with mercury. Nuggets are picked and the remaining "black sand" concentrates are treated with mercury to amalgamate the finer gold. A method to include this practice in mercury inventories is being developed. Regarding **Gold**, official exports are up over the last two to three years from 300-400M to 600-700M Kina (200M USD). Interpretation: an increase in permitting mechanized operations = increase in exports.

Two other key achievements are:

- A robust health manual and training program has been created
- The project has been re-shaped around mercury free processing demonstrations.

The anticipated long-term impacts of the project are: (i) increasing mercury free gold production; (ii) participation by PNG government in ASGM leadership internationally; (iii) continuous health training and awareness.

Supports ENV Mercury Goals

- ❑ **Goal 1** – Reduce the use of mercury in ASGM through partnerships, education, and better technology.
- ❑ **Goal 2** – Bring the ASGM sector into the formal economy where it is subject to government oversight.

Brown Bangan, Alluvial Miner, lease title holder, Nov 2022, Wau, PNG.

Mercury free gold production is important for the future of PNG's alluvial mining business. Most miners would gladly do it given a viable economic alternative.

- Brown Bangan, Alluvial Miner, Wau, PNG.

The Team

Artisanal Gold Council is a not-for-profit organization that works at the grass roots level to improve and professionalize the artisanal gold mining sector globally. "Engage to Improve!"

Kevin Telmer, Project Lead

Reducing Mercury through Local Action Plans

Reducing Mercury Supply and Availability in Indonesia

Project Purpose

In collaboration with the Indonesian government, civil society, academia, traders, and law enforcement agencies, this project works to reduce the amount of mercury available in the market, especially for the use in the artisanal and small-scale gold mining (ASGM) sector. By monitoring mercury trade, court cases and assisting four provincial governments to develop their Local Action Plans, BRI is supporting actions to achieve the national target of 100% mercury-free ASGM by 2025. To monitor the effectiveness of the regulations, mercury monitoring plans need to be established supported by increased capacity of stakeholders.

By the Numbers

20

Institutions *participated in workshops to develop the Local Action Plans and mercury monitoring plans*

465

People *participated in workshops and meetings to develop LAPs and mercury monitoring plans*

190

Cities/Regencies *with ASGM hotspots in 32 of 38 Provinces Indonesia*

2500-3500

Tons of mercury *used by ASGM miners in Indonesia annually*

Key Achievements

Assisting the development of national & local plans and policy to restrict mercury supplies from primary mining and mercury by-products other sectors. The project also facilitated the development of national & local plans and policy to monitor mercury supplies and trade and provide capacity buildings for stakeholders. The project assisted law enforcement agencies to develop guidance to secure confiscated mercury and prevent it from recirculated to the market. Lastly, the project facilitated the development of strategy and recommendations for mercury monitoring especially in ASGM hotspots.

Group photo of participants of the Inception Workshop for the project "Reducing Mercury Supply and Availability in Indonesia" in Jakarta, 29 July 2019 .

Supports ENV Mercury Goals

❑ **Goal 3** – Support the safe and legal management and storage of recovered mercury.

The Team

BRI is a non-profit scientific organization that focusing on emerging threats to wildlife and ecosystems through collaborative research and use scientific findings to advance environmental awareness and inform decision makers.
Nexus3 is non-profit organization work with stakeholders towards a just, toxics-free and sustainable future.
Dave Evers, PhD, Project Co-lead/Co-PI
Yuyun Ismawati, Project Co-Lead/Co-PI

Reducing the Illegal Trade of Mercury

Reducing Mercury Supply and Availability in Indonesia

Project Purpose

The purpose of the project is to support the Government of Indonesia (GOI) in restricting mercury supplies, through regulatory and policy action to restrict mercury supplies from primary mining and mercury by-products from other sectors; developing Local Action Plans (LAPs) to reduce and eliminate mercury in ASGM, including safe handling, interim or temporary storage for mercury and cinnabar to prevent them for being recirculated into the market; and monitoring mercury in the country.

By the Numbers

6
Institutions *participated in discussions to handle the illegal mercury trade*

28
People *participated in meetings to handle the illegal mercury trade*

19,327
Tons of mercury *confiscated and processed in courts*

8.68
Tons of cinnabar *confiscated and processed in courts*

Key Achievements

In collaboration with the MoEF, the project facilitated stakeholders in four provinces to develop LAPs to reduce and eliminate mercury. Mercury trade addressed through dialogues with policy makers and law enforcement agencies including with the e-commerce platform traders. Due to unclear guidance about the final verdict of confiscated mercury cases in courts – the evidence must be destroyed - some evidences have been stolen or recirculated to the market. To prevent it further, a technical guidance will be issued by the Attorney General concerning handling confiscated mercury and how to store it through three tiers storage system. Plans to monitoring mercury in the environment was developed as part of the LAPs and conducted by local stakeholders.

Illegally traded mercury is confiscated by local police stored at evidence storage room without proper required handling and storage.

Supports ENV Mercury Goals

- ❑ **Goal 3** – Support the safe and legal management and storage of recovered mercury.

The Team

BRI is a non-profit scientific organization that focusing on emerging threats to wildlife and ecosystems through collaborative research and use scientific findings to advance environmental awareness and inform decision makers.
Nexus3 is non-profit organization work with stakeholders towards a just, toxics-free and sustainable future.
Dave Evers, PhD, Project Co-lead/Co-PI
Yuyun Ismawati, Project Co-Lead/Co-PI

Developing Plan for Mercury Storage

Reducing Mercury Supply and Availability in Indonesia

Project Purpose

The purpose of the project is to support the Government of Indonesia (GOI) in developing and implementing multiple local plans for handling, interim storage, and final storage of mercury and cinnabar ore to prevent them for being recirculated into the market; and monitoring mercury in the country by expanding the National Implementation Plan into multiple Local Action Plans (LAPs) to reduce and eliminate mercury. This guidance includes the safe handling, interim storage, and final storage of mercury and cinnabar ore.

By the Numbers

6
***Institutions** participated in discussions on handling the illegal mercury trade*

28
***People** participated in meetings to handle the illegal mercury trade*

19,327
***Tons of mercury** confiscated and processed in courts*

8.68
***Tons of cinnabar** confiscated and processed in courts*

Key Achievements

In collaboration with the MoEF, the project facilitated stakeholders in four provinces to develop LAPs to reduce and eliminate mercury. Elemental mercury confiscated from gold mining, illegal imports, and other sources requires a secure tracking and storage system. This includes a decentralized storage system that allows law enforcement agencies to safely and securely store confiscated mercury in the field without unnecessary exposure, as well as a centralized storage facility for bulk mercury and cinnabar. The project recommended procedures in relation to the long-term storage/disposal of mercury and the need to convert it to safe, stabilized compounds that cannot be readily transformed back into commodity grade mercury.

Field visit to a mercury storage/ warehouse where 21 tons of mercury intercepted and confiscated by the local police.

Supports ENV Mercury Goals

- **Goal 3** – Support the safe and legal management and storage of recovered mercury.

The Team

BRI is a non-profit scientific organization that focusing on emerging threats to wildlife and ecosystems through collaborative research and use scientific findings to advance environmental awareness and inform decision makers.
Nexus3 is non-profit organization work with stakeholders towards a just, toxics-free and sustainable future.
Dave Evers, PhD, Project Co-lead/Co-PI
Yuyun Ismawati, Project Co-Lead/Co-PI

Monitoring Mercury through Local Action Plans

Reducing Mercury Supply and Availability in Indonesia

Project Purpose

The purpose of the project is to support the Government of Indonesia (GOI) in mercury monitoring to assess the environmental condition as related to inorganic mercury impacts to humans (through occupational use) and organic mercury impacts in the food web to biota and humans, while identifying actions to reduce the use and waste of mercury in communities due to ASGM activities, and follow-up adaptive monitoring to evaluate success.

By the Numbers

10
Institutions *participated in workshops to develop mercury monitoring plans*

95
People *participated in workshops and meetings to develop mercury monitoring plans*

4
Locations *in Provincial level planned for initial mercury monitoring*

4
Academic Institutions *engaged for initial mercury monitoring*

Key Achievements

In collaboration with four local universities, the project facilitated stakeholders in four provinces to conduct initial baseline studies for development of LAPs to reduce and eliminate mercury. The compilation of existing biotic mercury data is an important approach to understand broad spatial gradients and temporal patterns. The equatorial Pacific region is an essential commercial harvesting location for many large pelagic species, such as tuna, that are responsible for a large fraction of human exposure to methylmercury—the organic form of mercury that enters the food web. Thus, linking elevated mercury deposition to methylmercury formation in the ocean and associated biological exposures is an important goal of ongoing research.

Mercury air sampling with Lumex Portable Mercury Analyzer in ASGM processing area.

Supports ENV Mercury Goals

- ❑ **Goal 3** – Support the safe and legal management and storage of recovered mercury.

The Team

BRI is a non-profit scientific organization that focusing on emerging threats to wildlife and ecosystems through collaborative research and use scientific findings to advance environmental awareness and inform decision makers.
Nexus3 is non-profit organization work with stakeholders towards a just, toxics-free and sustainable future.
Dave Evers, PhD, Project Co-lead/Co-PI
Yuyun Ismawati, Project Co-Lead/Co-PI

Raising Awareness on the Finances of Illicit Mercury Trade

Regional workshop on irregular trade and storage of mercury for illegal mining: current risks and trends

Project Purpose

This project promotes the implementation of the Minamata Convention by OAS member states. It works to understand the mechanisms in place to control the importation, storage, use and disposal of mercury for gold mining, while fostering cooperation among OAS member states to investigate and prosecute the illegal trade and smuggling of mercury, assisting member states in developing their action plans for mercury reduction, and increasing the capacity of officers from customs, law enforcement and prosecutorial authorities to identify, seize and sanction the illicit transportation and use of mercury.

By the Numbers

27

Representatives from authorities responsible for the implementation of the Minamata Convention.

5

Number of Latin-American Countries represented in the meeting

11

Expert recommendations for strengthening mercury control systems in Latin-America

Key Achievements

The experts advised DTOC to present the following proposal to the Commission on Hemispheric Security (CSH) of the OAS:

- To generate spaces for dialogue, exchange of experiences, methodologies and good practices to improve mercury control systems in the region.
- To raise funds to develop technical assistance projects and promotion of international cooperation to improve Use Control Systems, legal or illegal trade, temporary storage, final disposal and remediation.

Group picture of the participants of the workshop held by OAS-DTOC in Peru. October 2022.

Supports ENV Mercury Goals

❑ **Goal 2.1** – Regulatory frameworks addressing the ASGM sector and mercury use are established, coordinated, and enforced across relevant government ministries and law enforcement.

The Team

Department against Transnational Organized Crime of the Organization of American States, Artisanal Gold Council –AGC (partner), Gastón Schulmeister (DTOC Director), John Grajales (Project Manager), Karoline Moraes (Project Specialist).

PROMOTING MERCURY-FREE MINING IN GHANA

Project Purpose

Promoting Mercury-Free Mining in Ghana (Pro-MFM) is a four-year project (2020-2024) funded by the U.S. Department of State and being implemented by Pact and Solidaridad. Pro-MFM aims to reduce the use of mercury in Ghana's artisanal and small-scale gold mining (ASGM) sector through education, the introduction of better technology, a strengthened equipment supply chains, and demonstrating business incentives for mercury-free gold production.

Pro-MFM is working with legally registered ASGM groups in the Western, Western North, and Ashanti Regions, as well as a range of stakeholders, including government agencies, gold traders, and communities to achieve two core objectives:

- Demonstrate effective and scalable mercury-free gold production by supporting the appropriate selection for (and then procurement and installation of) mercury-free mineral processing technologies. This technical focus is bolstered by support to mines in developing Mine Plans – which will enable mines to access formal investment, and support supply chain due diligence, transparency.
- Our second core objective is to support ASGM stakeholders to achieve obligations of the Minamata Convention through awareness raising, institutional capacity building and demonstrating the business case for mercury-free gold production.

By the Numbers

8
ASGM communities have been sensitized on the dangers of mercury and responsible use of mercury

1
Mine received mercury-free processing equipment (Shaking table)

4
Mineral processing analysis carried out in 4 mines to acquire appropriate mercury-free processing equipment

5
Mine business plans developed for mercury-free mineral processing and finance application

Sensitization on dangers of mercury sage in a community

Shaking Table installed at Bazuri Mine producing Hg-free gold

Key Achievements

1. Sensitization of ASGM mining Communities on Dangers of Mercury usage

- Developed a 10-minute **documentary film** on mercury-free mining in 2022;
- Raised awareness about and sensitized **eight communities** on mercury-free mining through a series of media campaigns, including radio programming, posters, and workshops.

2. Support for mercury-free mineral processing equipment

- Developed five "Mine Profiles" - two-page documents featuring partner mines - as communications tools.
- Conducted detailed mineral assessments at 5 mine sites, while supporting miners in understanding and selecting mercury-free mineral processing equipment.
- Hosted a "Shark Tank" style event for ASGM miners to present and advertise their mine plans.
- Worked with equipment vendors and mine operators to "cost-share" for processing equipment.
- Installed the first mercury-free equipment at Bazuri mine in 2023 (shaking-table).
- Supported four additional mines in progress of procurement, who are currently saving for cost-share.

3. Fostering supply chain due diligence and increase transparency

- Completed a **CRAFT Code compliance assessment** with 5 beneficiary mines;
- Developed action plans for each mine to meet CRAFT Code requirements.

Supports ENV Mercury Goals

- ❑ **Goal 1** – Reduce the use of mercury in ASGM through partnerships, education, and better technology.
- ❑ **Goal 2** – Bring the ASGM sector into the formal economy where it is subject to government oversight.

Demonstration of the "Gold Katcha" concentrator – part of Hg-free equipment solution, at Agapa Ye mine site

Some words from a Gold Mine partners:

"The GoldKacha Concentrator and Gold Konka are what we needed for last year's productions when we were producing higher tonnages because this is more efficient, less time-consuming, and yields higher gold recovery" Mr. Ababio of Agya Pa Mine

The Team

Pact is an international NGO working with governments, communities and private partners to make ASM safer, formal and more productive.

Solidaridad is an international Civil Society Organization that promote sustainable supply chains, and have been working in Ghana's gold sector for more than a decade.

OES | BUREAU OF OCEANS AND INTERNATIONAL ENVIRONMENTAL AND SCIENTIFIC AFFAIRS

Office of Environmental Quality (ENV)

ASGM formalization & mercury reduction

Promoting a Mercury-free Mali (Pro-MsM)

Project Purpose

The "Promouvoir un Mali sans mercure" (Pro-MsM Project) is a four-year U.S. Department of State-funded project implemented by Pact, designed to reduce mercury use in the ASGM sector while strengthening and legitimizing formal ASGM supply chains. Pro-MsM targets ASGM miners, gold traders and local authorities in Cercle de Keniéba, who are responsible for some 70% of Mali's mercury use. The Pro-MsM project has three main pillars:

1. Support ASGM formalization and business management.
2. Technical support for mercury reduction and awareness raising.
3. Strengthen responsible and transparent ASGM supply chains through due diligence mechanisms.

By the Numbers

196

ASGM miners, gold traders, local authorities, and civil society actors trained

1

***Policy paper** validated for promoting responsible gold trade in Mali*

1500

ASGM association members benefiting from formalization support ('Dje Kabara')

1

***Mine business plan** developed for mercury-free mineral processing and finance application*

Demonstration of the 'cupellation method' in Keniéba

Dje Kabara's women miners leading training discussions

Key Achievements

1. ASGM formalization and business management

- Obtained approval from local authorities to relocate Dje kabara's processing site for ***land access;***
- Trained 61 association members on business management and completed an ***ASGM business plan;***
- Trained 196 ASGM stakeholders on formalization steps and ***regulatory frameworks.***

2. Technical support for mercury reduction and awareness raising

- Completed laboratory tests to analyze ores and inform mercury-free mineral processing flowsheet;
- Trained 196 ASGM miners and other stakeholders on ***mercury-free mineral processing;***
- Engaged a ***local fabricator*** in Bamako to fabricate mercury-free equipment (installed in July 2023);
- Engaged a media company to start an **awareness raising campaign** in productive ASGM regions.

3. Transparent supply chains and due diligence

- Completed a **CRAFT report** assessing and risks (env, health, security) in ASGM production and trade;
- Engaged comptoirs, refiners, government and civil society in 2 workshops to discuss barriers and recommendations for formal gold trade, and ***validate a policy paper.***

Supports ENV Mercury Goals

- ❑ **Goal 1** – Reduce the use of mercury in ASGM through partnerships, education, and better technology.
- ❑ **Goal 2** – Bring the ASGM sector into the formal economy where it is subject to government oversight.

Women miners showing their certificates after becoming 'professional gold miners' during a training in Keniéba

"Promouvoir un Mali sans mercure, c'est pour nous un espoir sans limite."

(The promoting a Mercury-free Mali project means hope without limits for us).

- President of Dje Kabara, Djidjan-Keniéba

The Team

Pact is an international NGO working with governments, communities and private partners to make ASM safer, formal and more productive.

Pro-MsM team: Halimata Barry, Aly Diarra, Boukoro Diarra, Jorden de Haan and Daniel Stapper

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

Project Purpose

This is a mining tailing that will be treated by the Pure Earth team to reduce the amount of mercury.

In collaboration with the Colombian government, civil society, the private sector, and affected communities, this project worked to **reduce the amount of mercury** available for use in the artisanal and small-scale gold mining (ASGM) sector. By piloting **environmentally responsible mercury recovery techniques** and making significant progress in the development, adoption, and implementation of recommendations for improved **policies and technical protocols to safely store and dispose of mercury recovered** from contaminated tailings, this project demonstrates a **sustainable model** for governments to remove mercury and ensure it is not reintroduced to the market.

By the Numbers

8
Technical documents *published on monitoring and storing recovered mercury*

2
New national frameworks *for monitoring and storing recovered mercury*

2
Copper plate modules delivered for processing mercury from mining tailings

1
Warehouse for the temporary storage of mercury

+300
Tons of contaminated tailings processed

84
Percent of mercury *recovered, in ideal conditions from tailings using the copper plates technology.*

90
Percent of gold *recovered from 200 tons of treated tailings*
.

+280
Miners trained in tailings management and storage of recovered mercury

+63
Agencies at tailings management workshops

5
Mercury precipitating materials were tested in the cyanidation process

Supports ENV Mercury Goals

- **Goal 1** – Reduce the use of mercury in ASGM through partnerships, education, and better technology.
- **Goal 3** – Support the safe and legal management and storage of recovered mercury.

The Team

PUREOEARTH

Is an international non-profit organization dedicated to solving pollution problems in low and middle-income countries, where human health is at risk.

Lina Hernandez, Project Lead and
Alfonso Rodriguez, Project Coordinator.

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

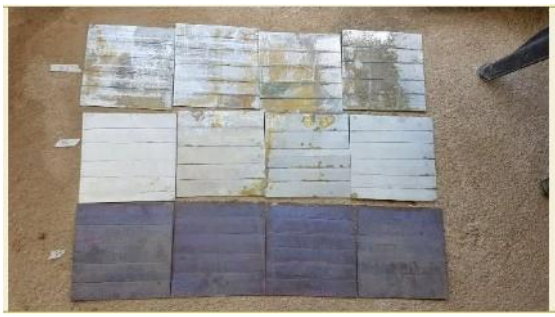
Key Achievements

The project developed a model for responsible and profitable recovery of mercury and gold from tailings, providing economic and health benefits for the communities associated with mercury based ASGM sites.

Left: Electroplating process of copper plates.

Improvement of the prototype for the use of Pure Earth's copper plate technology.

Impact of tailings treatment with plates.



The project's pilot site model can be replicated to create economically viable and environmentally responsible approaches to removing mercury contamination elsewhere in Colombia. The framework for safe handling, storage and disposal of recovered mercury will help ensure mercury no longer re-enters the ASGM sector, thereby reducing the overall supply of mercury. Colombia is at the forefront of storing recovered mercury and delineating which ministries regulate each step of the process to ensure it works.

Clean gold recovered from treated tailings.

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

Key Achievements

Miner Training

By raising awareness among the ASGM sector of the importance of eliminating the use of mercury during gold mining and tailing processing, we trained miners in waste management and the storage of recovered mercury.

Mercury Storage Unit

Installation and delivery of a mercury storage unit to the environmental authority. This consists of a galvanized steel laboratory refrigerator with a capacity of up to 3 tons operating at 80% storage capacity. This unit has 5 shelves, locks, an electronic control panel with alarm system and data logger.

National Table for Mercury Control

New national frameworks for the management and storage of recovered mercury were established through the development of technical documents. examples of good practices that led to the creation of the National Table for Mercury Control with governmental entities' support.

OES BUREAU OF OCEANS AND INTERNATIONAL ENVIRONMENTAL AND SCIENTIFIC AFFAIRS

Office of Environmental Quality (ENV)

Geomorphic Mapping and Resource Assessment to Reduce Mercury Use and Other Environmental Impacts of Artisanal and Small-Scale Gold Mining (ASGM) in Guyana

Project Purpose

Limiting the spatial extent of ASGM to the most productive gold deposit zones may substantially reduce the footprint of both environmental degradation and mercury contamination due to ASGM. The development of spatially predictive models of mining activity and gold deposit geomorphology are being developed to indicate areas that may be converted for mining in the near future and may thus help improve government oversight and limitation of gold mining to productive zones. A method to map zones of potential ASGM productivity in Guyana through Digital Elevation Model (DEM) editing, geomorphologic mapping, and geospatial analysis is being produced and distributed to the relevant stakeholders (MNR, GGMC, GFC, EPA and Mining School Members). The critical information base that this zonation mapping will provide can then be used to reduce the total area within which ASGM and Hg amalgamation occurs.

By the Numbers

3

Study area watersheds covering over 2,550 km² geomorphologically mapped

3

DEMs improved and edited for analysis

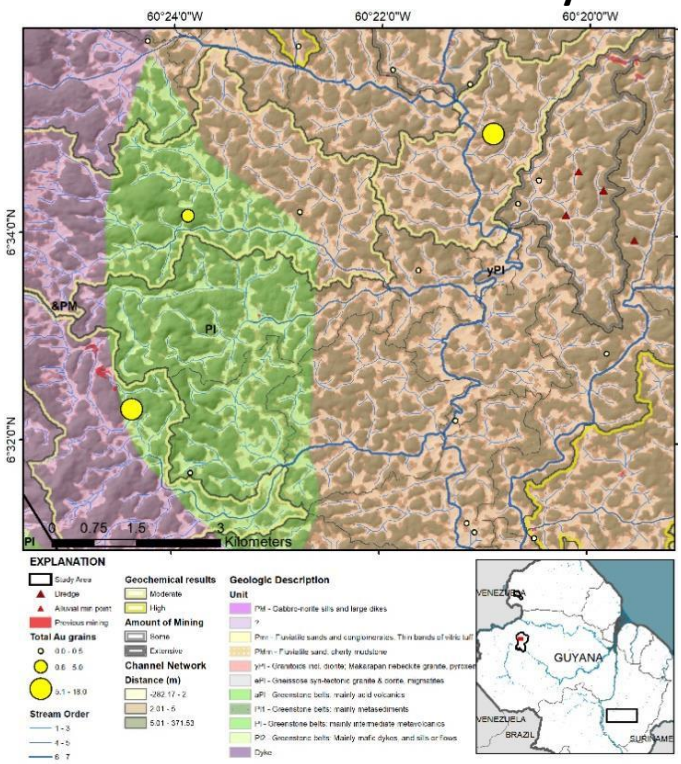
5

In partnership with five agencies within the Government of Guyana

1

Priority watershed zone targeted for high-resolution mapping and field sampling

Key Achievements



Geomorphologic map of one of the priority zones and related data sets compiled with collaboration from the Government of Guyana.

- Compilation of available data on gold occurrences and grades, the underlying geology and geologic evolution of gold deposits, and the geomorphology of the surface layers.
- Detailed deposit model will be presented as a series of map datasets that integrate geographic information systems and remote sensing analyses.

Supports ENV Mercury Goals

- **Goal 1** – Reduce the use of mercury in ASGM through partnerships, education, and better technology.
- **Goal 2** – Bring the ASGM sector into the formal economy where it is subject to government oversight.

The Team

USGS, MNR, GGMC, GFC, EPA, Guyana Mining School and Training Centre Inc.

Pete Chirico, Jessica DeWitt, Marissa Alessi

Geospatial Technical Training Sessions

Geomorphic Mapping and Resource Assessment to Reduce Mercury Use and Other Environmental Impacts of Artisanal and Small-scale Gold Mining (ASGM) in Guyana

Project Purpose

In cooperation with the government of Guyana, multiple working groups and virtual technical training courses are in progress to transfer knowledge of remote sensing and geospatial methods for the mapping and monitoring of artisanal and small-scale mining (ASM) in Guyana. Working groups on individual topics are established and meet regularly to share techniques and data to collaborate on the project goals. Training series are being conducted based on expressed interests in topics from the government of Guyana and cooperators. Each session is open to any interested party where a lecture on the topics, a demonstration of methods, and training materials are provided. Sessions include geomorphological mapping methods, with the purpose of educating miners in how the maps may be used to target the highest potential zones and thus reduce the environmental cost and use of mercury for gold mining; Synthetic Aperture Radar (SAR) data analysis methods; and turbidity mapping training tailored for Guyana.

By the Numbers

3

Working groups collaborate and meet frequently on the progress of the project.

48

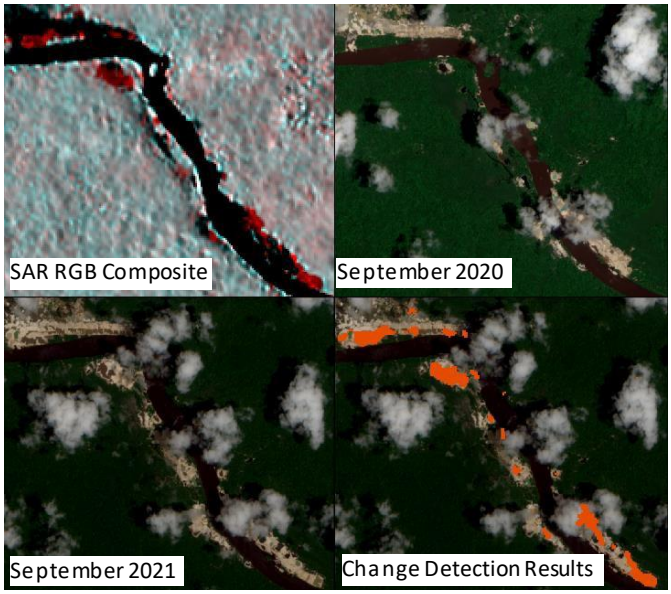
Participants trained in remote sensing and geospatial mapping techniques.

6

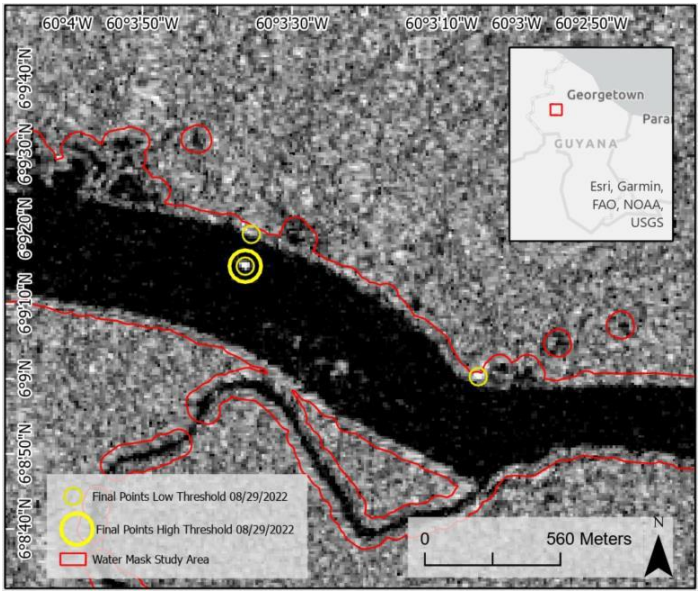
Agencies, including the Guyana Mining School and Training Centre Inc.

9

Topics addressed with demonstrations and training materials provided.



SAR for change detection on the Mazaruni River where it can measure differences in backscatter even through cloud cover.



Example of a dredge detection result from the SAR training session on river dredge mapping.

Key Achievements

Through training and working group sessions the team has created a workflow for mapping of alluvial placer deposits that is being shared with miners through the Guyana Mining School and Training Centre to help prospect mining locations. A tailored method for mapping and monitoring turbidity in the rivers of Guyana has been established. The training sessions have established the development of geospatial and remote sensing analysis knowledge and skill sets that can be applied to a wide variety of topics and will help with managing and monitoring mining and environmental effects for multiple agencies. The trainings introduced new techniques and new data types and sources to the groups.

Topics covered

- Synthetic Aperture Radar uses
  - Water area / flood mapping
  - Riverbank change
  - Change detection for deforestation
  - Oil spill detection
  - River dredge detection
- DEM editing
- Geomorphological mapping
- Turbidity mapping and monitoring
- Hand auguring field methods

Agencies

- GGMC
- GFC
- EPA
- MNR
- Guyana Mining School and Training Centre Inc.
- Guyana's Reducing Emissions from Deforestation and forest Degradation (REDD+) Program

Supports ENV Mercury Goals

- ❑ **Goal 1** – Reduce the use of mercury in ASGM through partnerships, education, and better technology.
- ❑ **Goal 2** – Bring the ASGM sector into the formal economy where it is subject to government oversight.

Photograph of MNR, GGMC, and US Embassy team during site visits to Guyana

"The knowledge gained will allow for better planning of projects with a greater understanding of the impact of the Geomorphological features"

"[The training will] help with my research project for my second BSc 2 [and] it will help me create maps and plan my field activity more efficiently [and] it will help build my knowledge on remote sensing and GIS based projects"

The Team

MNR, GGMC, GFC, EPA, Guyana Mining School and Training Centre Inc., USGS

Pete Chirico, Jessica DeWitt, Marissa Alessi

Riverine Turbidity Mapping and Monitoring

Geomorphic Mapping and Resource Assessment to Reduce Mercury Use and Other Environmental Impacts of Artisanal and Small-scale Gold Mining (ASGM) in Guyana

Project Purpose

The Guyana EPA requested support for this project in search of options for mapping and monitoring riverine turbidity through remote sensing to assess potential environmental impact from ASM. Increasing turbidity in waterways has been observed with the increase in river mining operations and can have negative impacts on the habitat and productivity of the rivers. A working group with individuals from the EPA, GGMC, and USGS was formed to research options and create a procedure to be implemented for long term monitoring. A tailored remote sensing method was developed that addresses the specific environmental conditions of Guyana. The method is tested in the Puruni and Potaro rivers to map the turbidity level across three date ranges and the accuracy is measured using data collected in-situ by our partners. Remote sensing techniques can provide wider coverage and allow a more time and cost-effective environmental monitoring strategy when used in combination with in-situ measurements.

By the Numbers

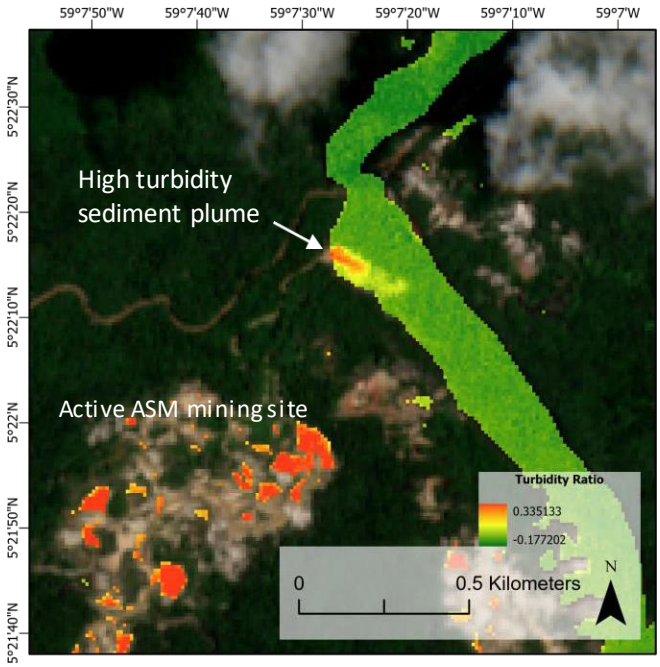
2 *Study areas, the Potaro and Puruni River*

88 *In-situ turbidity measurements*

1 *Research journal article in production*

6 *Turbidity maps of two rivers impacted by ASM*

Key Achievements



Close up example of a turbidity map produced using the new methods developed by the team showing a tributary surrounded by ASM emptying into the Potaro River.

- Development of a new satellite imagery band ratio that addresses the environmental conditions of the rivers of Guyana.
- Correlation between in-situ turbidity measurements and Sentinel-2 band reflectance values was established.

Supports ENV Mercury Goals

- ❑ **Goal 1** – Reduce the use of mercury in ASGM through partnerships, education, and better technology.
- ❑ **Goal 2** – Bring the ASGM sector into the formal economy where it is subject to government oversight.

The Team

Reshana Thomas (EPA), Soyini McPherson (GGMC), Niome Monsar (EPA), Marissa Alessi (USGS), Pete Chirico (USGS)

Strengthening Women's Participation in ASGM mining in the Chocó

The Colombia Mercury-Free Future Project

Project Purpose

Two Afro-Colombian community councils the Choco region will access new and legal gold markets, improve their productive practices, and maintain legality to ensure that mercury is not used in mining sites in their ethnic territories. The project's goal is to strengthen the resilience of ASGM ethnic communities in Colombia to withstand pressure from actors within the informal sector to sell gold outside the formal supply chain or to purchase mercury for gold processing.

By the Numbers

2
Tons of mercury released prevented

200
Kilograms of mercury-free gold produced

100
Miners beginning legal mining registration

4
Papers to improve international policies

150
Miners trained in mercury-free processing techniques

4
Laws, policies, and regulations introduced for conservation

2
Mining organizations formalized

200
People trained in biodiversity conservation

Supports ENV Mercury Goals

- **Goal 1** – Reduce the use of mercury in ASGM through partnerships, education, and better technology.
- **Goal 2** – Bring the ASGM sector into the formal economy where it is subject to government oversight.

Key Achievements

By supporting the formalization processes and mining planning instruments, the project strengthens the Ethnic Mining Special Reserve Areas, improving the quality of life of miners in impoverished areas by improving incomes, the environment, and ethno-mining governance. The results are being shared with the Ministries of Mines and the Environment, who are part of the Government of Colombia's National Development Plan 2022-2026. These results will be incorporated into new mining processes in the Pacific and other regions of Colombia where mining is taking place in ethnic territories.

Integrating a gender approach to this work has been a focus of activities in the Afro-Colombia territories engaged in the project. In Cocomaupa, the project has worked with 38 women who are interested in organizing collectively to improve the conditions of artisanal mining and the income from the sale of gold. The women range from 25-73 years old. Although some have been involved in artisanal mining since as young as 12 years old, they have no experience with building a mining association. They have been victims of various forms of violence and contribute essential economic support for their families. These women are "guardians" of sustainable techniques for gold extraction.

The project is capacity building in the following areas:

- Strengthening of human rights and women's rights.
- Strengthening women's leadership.
- Marketing and technological improvement.

The strengthening of a women's mining organization in Cocomaupa has been an unexpected result that will bring added value to positively impact ASGM in the territory.

The Team

WWF-US; WWF-Colombia; Alliance for Responsible Mining (ARM); Environmental Research Institute of the Pacific (IIAP); Afro-Colombian Community Councils of ASOCASAN and COCOMAUPA