

Tracing Mercury Avoidance from ASGM through *Jari Emas*



GOLD-ISMIA developed ‘Jari Emas’ mobile application and web portal database to support digitization in the inventory of mercury avoided from the ASGM sector. Since its official go-live for public on 01 January 2022, Jari Emas has recorded a total of 8.59 ton mercury avoided. With further coordination with the Ministry of Environment and Forestry as the National Secretariat of Minamata Convention, this application can be expanded to other ASGM sites, providing the Government of Indonesia with a national database of mercury avoidance by means of reduction from the sector.

A. Introduction

Having an estimate of the quantity of mercury avoided is a key early step in measuring the progress of projects targeting at reducing mercury use from the ASGM sector, among which is the Global Opportunity for Long-term Development – Integrated Sound Management of Indonesia’s Artisanal and Small Scale Gold Mining (GOLD-ISMIA). The Project aims to reduce at least 15 tonnes of mercury release by 2023.

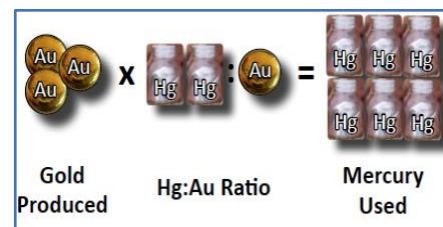
To start with, it is important to address this basic question: “How much mercury has been used by the artisanal gold miners?”. Finding the answer to this question is not easy due

to the complex and largely informal nature of ASGM sector. For this reason, GOLD-ISMIA made estimation of mercury avoided by using the Hg:Au Ratio which is considered the most suitable approach in estimating mercury use in ASGM sector (O’Neill and Telmer, 2017)¹.

B. Estimating Mercury Avoidance using the Hg:Au Ratio

The Hg:Au Ratio is described by O’Neill and Telmer (2017) as ‘the amount of mercury used to produce that gold can be yielded by multiplying the two numbers’, as reflected below:

Equation 1. Hg:Au Ratio



- **Gold Production:** The amount of gold produced in a specific amount of time (e.g., grams of gold produced annually)
- **Mercury-to-Gold (Hg:Au) Ratio:** The typical amount of mercury, in grams, used to produce one gram of that gold. This ratio is specific to the processing method used to produce the gold.

The Hg:Au Ratio is site specific, for which GOLD-ISMIA conducted field research in 3 project locations, namely: Anggai, Tatelu, Pelangan and Buwun Mas Villages, in the late 2019². The key highlights resulted from the field research are as follows:

¹ The other approaches are ‘consultation with official mercury data documents’ and ‘interviews with mercury sellers and users’. For countries where mercury trade is illegal, such as Indonesia, the trade data will be coarse and dated estimate and the interview requests may not be well responded by the sellers and traders (O’Neill and Telmer, 2017). Accessible at: <https://wedocs.unep.org/handle/20.500.11822/22894?show=full>

² https://www.goldismia.org/sites/default/files/2021-01/rev1_Fact%20Sheet%20no.2%20%20WGC%203%20Feb2020.pdf

1. A total of 34,104 tonnes ore processed per year for which 852.6 tonnes Hg were used. Based on the mass balance calculations, 99.35% of the Hg used is recovered and re-used from which it can be calculated that **5.54 tonnes Hg lost per year** in these locations.
2. From the 34,104 tonnes of ore processed, the **total gold produced was 0.87 tonnes**, for an **average gold grade of 25.4 g/tonne**.
3. Estimated **Hg: Au Ratio is 6.857 to 1** (for each gram of gold produced, nearly 7 grams of Hg is released to environment).

This estimated ratio is consistent with Veiga et al. (2009) stating that based on their field observations in Indonesia, ‘when Hg is used inside ball mills to amalgamate the whole ore, the amount of Hg lost is at least times the amount of gold produced.’

The Hg: Au Ratio was further applied to estimate the mercury avoided in the 5 project locations with primary gold deposits, using the following conditions³:

1. *the ore is processed using a mercury-free technique, or in this case is ‘cyanidation’.*
2. *per ton of ore processed, 25 kg feeding mercury is used and 0.65% of which is lost to the environment, meaning that 0.16 kg mercury avoided/ton gold ore.*

This application shows consistent result and for ease of reference, the calculation is described as follows (in one month production):

Equation 2. Correlation between ‘total ore processed’, ‘total Hg avoided’ and ‘total gold produced’

Total ore processed per month (tonnes)	Total Hg avoided feed per month (tonnes)	Total Hg avoided loss to environment per month (tonnes)	Total gold produced per month (kg)
A	$B = A * 0.025$	$C = B * 0.65\%$	$D = C / 6.857 * 1000$

³ <https://www.goldismia.org/sites/default/files/2022-02/Update%20Road%20map%20avoided.pdf>

C. Designing the Mobile Application

Moving forward from the field research, GOLD-ISMIA targets at development of a mobile application and a web portal database through which the estimation of mercury avoided from the Hg-free gold processing facilities can be monitored in systematic way and on regular basis. The mobile application will allow the Project collect the site-specific variable (i.e., total ore processed) from the owners or operators of processing units per batch of gold production through existing mining cooperative. Meanwhile, the web portal database will assist GOLD-ISMIA estimates the total mercury avoided from a specific site or region.

The development of the mobile application and web database, which were later named ‘Jari Emas’ (or ‘golden finger’ in English), consisted of 3 phases, as follows:



Chart 1. Development Stages of Jari Emas Mobile Application

Jari Emas was launched in Google Play on 1 January 2022 through this link:

<https://play.google.com/store/apps/details?id=com.planetgold.jariemas>.



Selamat Datang di Jari Emas



Planet Gold adalah aplikasi pencatatan kegiatan pertambangan emas skala kecil di Indonesia. Kunjungi www.goldismia.org untuk informasi lebih lanjut.

Riau Province which is the only project location with secondary gold deposits. By this, the application of Jari Emas will be able to accommodate both primary and secondary gold deposits in Indonesia.

Figure 1. Jari Emas Welcome Page

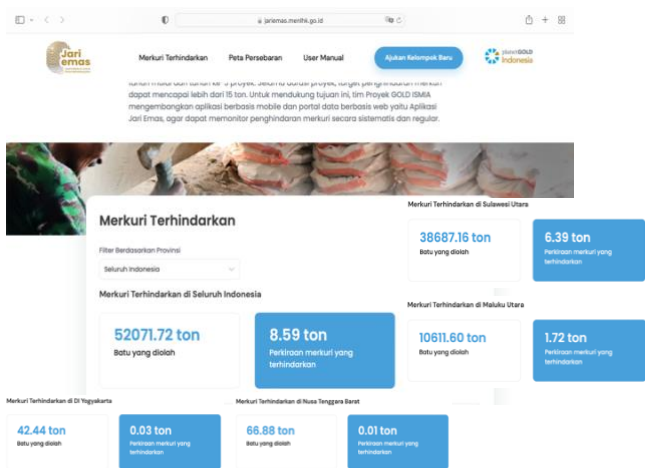


Figure 2. Jari Emas Landing Page at <https://jariemas.menlhk.go.id>

As of 31 June 2022, Jari Emas has recorded a total of 8.59 ton mercury avoidance throughout 4 project sites between 2019 and 2022. To encourage the miners to actively input data, a point reward system has been applied in Jari Emas, by which the miners can redeem their points in forms of cellular or electricity credit balances.

D. Summary

The Jari Emas Android Mobile Application has been GOLD-ISMIA's attempt to tap into technology for data collection of estimated mercury avoidance in Indonesia. The artisanal miners' unfamiliarity with bookkeeping of their production has been the Project's main challenge in data collection. For this reason, in coordination with the existing mining cooperatives within the project locations, GOLD-ISMIA has conducted regular trainings on the use of Jari Emas for the members and non-members. In addition, a 'template form' has also been provided to these cooperatives for offline recording.

For further data enrichment, GOLD-ISMIA has scheduled a field research in August 2022 in Kuantan Singingi District,

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Special appreciation to the Field Facilitators for being implementing arms of the project in the field.

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