Required Elements of the NAP Part 4: Baselines of Mercury Use and Practices

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ARTISANAL GOLD COUNCIL

Summary

- About AGC
- Details on inventory development
- Practical steps to take into consideration
- Methodology used
- Main expected results; how the inventory could be used to set reduction targets

Introduction

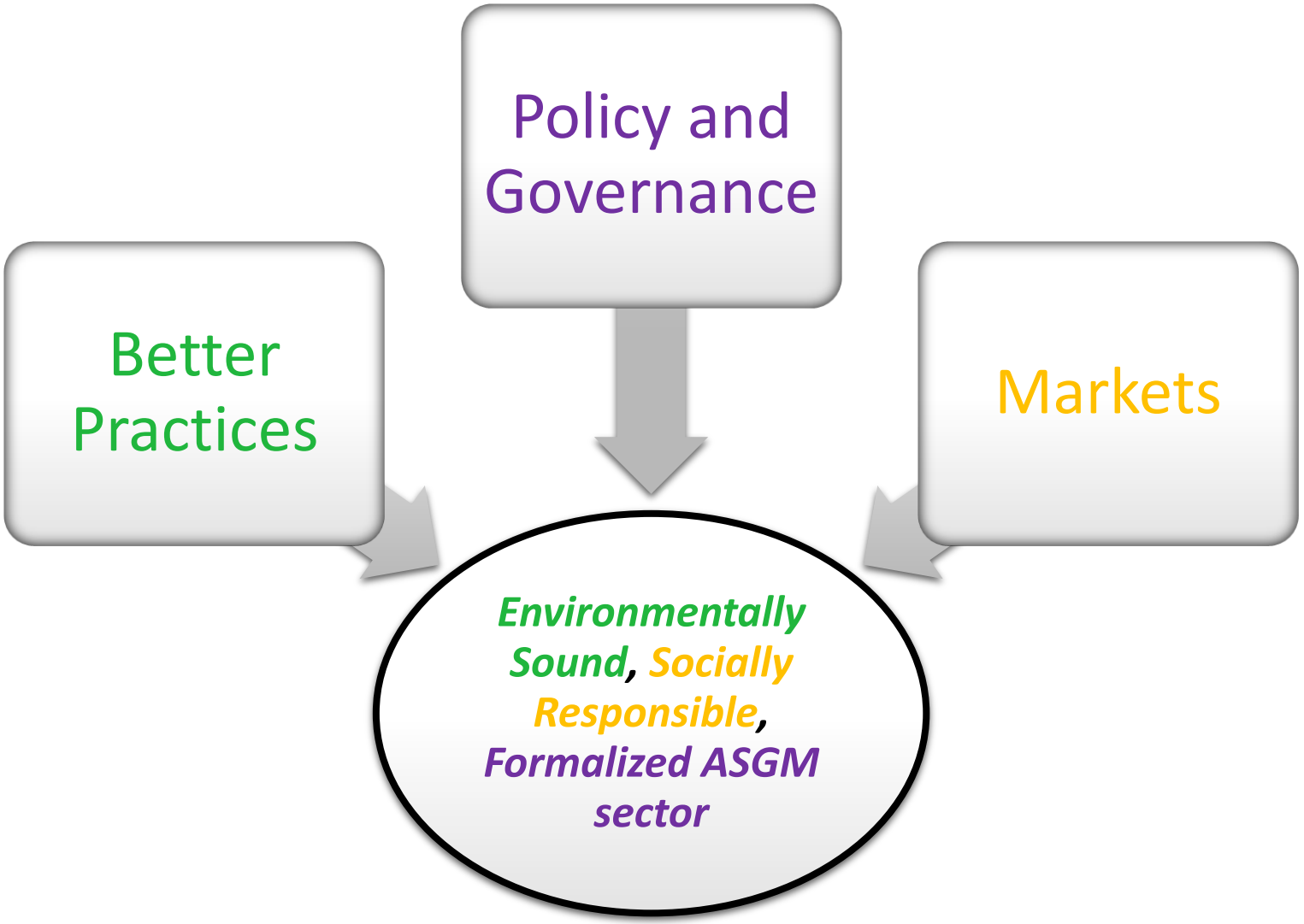
ARTISANAL GOLD COUNCIL

Dedicated to improving the opportunities, environment, and health of millions of people involved in Artisanal Gold Mining

- Based in Canada with projects and linkages across 3 continents, Africa, South America, Asia
- Deep field knowledge with Artisanal Gold Mining communities from decades working with miners, governments, and industry
- Many collaborations

AGC Locations

Approach


Policy and Governance
Better Practices
Markets
Environmentally Sound, Socially Responsible, Formalized ASGM sector

Better Practices

- Technical Interventions for improved practices
- Mercury reduction and mercury free processing
- Tailings management and remediation
- Health and safety, business, and administrative training

Policy and Governance

- **Information gathering and ASGM sector databases; Deep Field Knowledge**
- Institutional capacity building and National Action Plan development
- ASGM Policy recommendations
- Facilitating stakeholder dialogue

Markets

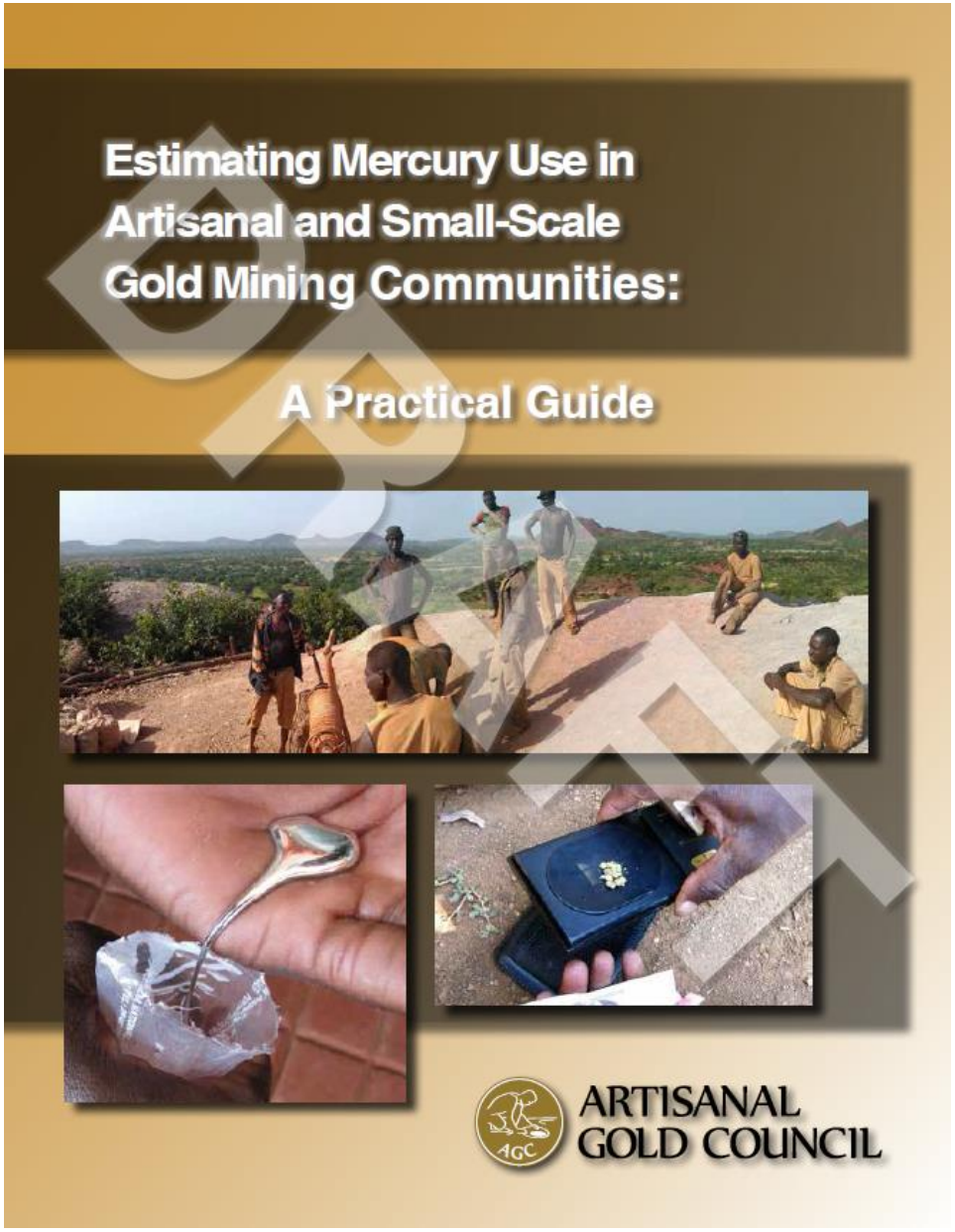
- Building of a responsible ASM gold trade chains from mine to market
- Strengthening collaborative relationships, identifying buyers and brokering business partnerships
- Capitalizing miners
- Communications and outreach campaigns

Inventory Guide

Persaud A., and Telmer K. (2015)

Developing Baseline Estimates of Mercury Use in Artisanal and Small-Scale Gold Mining Communities: A Practical Guide
(Version 1.0)

Artisanal Gold Council. Victoria, BC. ISBN 978-0-9939459-4-6.



Convention Connections - Article 7

- Paragraph 3: Each Party shall notify the Secretariat if at any time the Party **determines that artisanal and small-scale gold mining and processing in its territory is more than insignificant**. If it so determines the Party shall:
- Paragraph 3(a) Develop and implement a national action plan in accordance with **Annex C**
- Paragraph 3(c) Thereafter, provide a **review** every three years of the progress made… pursuant to Article 21.

NAP Obligations - Annex C:

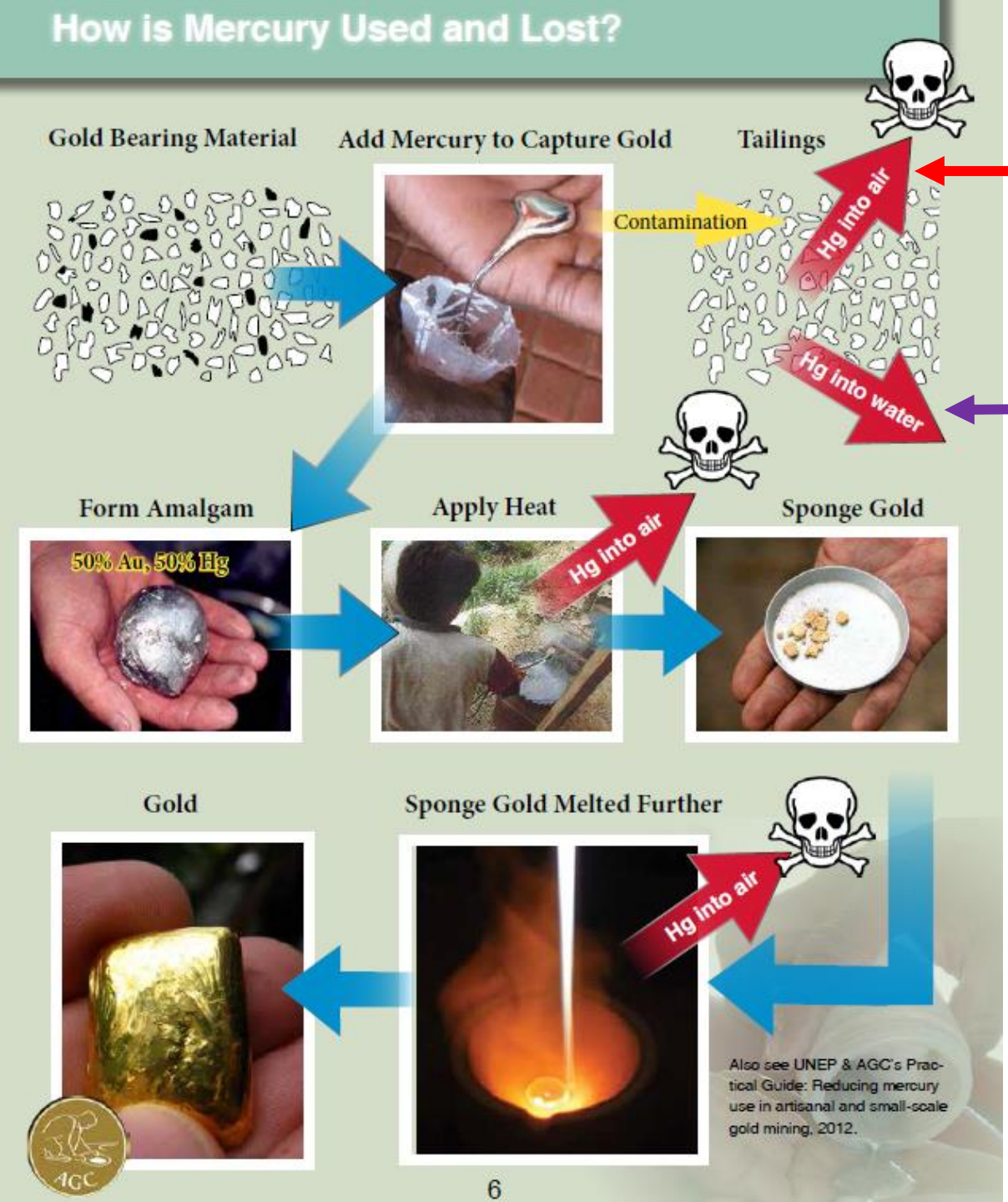
(a) **National objectives and reduction targets;**

(d) **Baseline estimates** of the quantities of mercury used and the practices employed in artisanal and small-scale gold mining and processing;

(g) Strategies for involving stakeholders in the implementation and continuing development of the national action plan;

(j) Strategies for providing information to artisanal and small-scale gold miners and affected communities.

Summary: **a systematic and regularly updated database on mercury use in ASGM**



Emissions versus Releases

Key Information Required

1. **Is mercury used?**
2. **What are the ore treatment/production methods?**
3. **How much mercury is consumed per unit of gold?**
4. **How much gold is produced?**
5. **How many miners are there?**
6. **How much money do the miners make or spend?**

What Works?

Estimating Mercury Use -- What Doesn't Work

- Directly asking about mercury use and gold production
- Arriving on a site with the military or police
- Telling miners what they should and should not do
- Identifying problems without providing solutions
- Ignorance – basic prior knowledge about ASGM is required to work with miners

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Estimating Mercury Use -- What Works

- The development of positive relationships and trust with the miners through field work and complementary support services
- Basing estimates on multiple lines of evidence and adequate sample sizes in order to improve accuracy and reliability
- A flexible strategy to adapt to changing circumstances and different contexts
- A team with a strong understanding of the technical, social, economic and political aspects of ASGM that can be built through training and hands on experience

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1. Is mercury used?

- It can be obvious





1. Is mercury used?

- What does the gold look like that is being sold on the site?

1. Is mercury used?

- Is there equipment that points toward mercury use such as retorts or blow torches?

1. Is mercury used?

- Gold dust generally has not been produced with mercury

Key Information Required

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Mozambique whole ore amalg…

High intensity whole ore amalgamation

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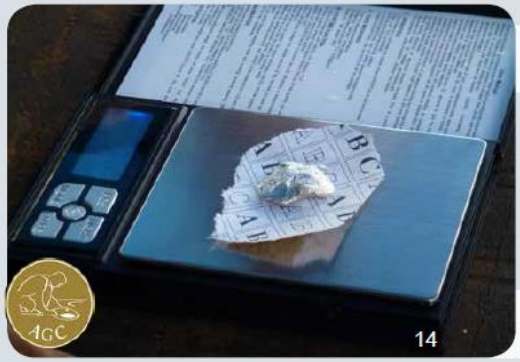
Example: measuring the Hg:Au ratio

1 Weigh the total amount of mercury before it is applied to the concentrated ore.

2 Weigh the excess mercury not forming a part of the amalgam.



3 If possible, weigh the amalgam formed after mixing the mercury with the concentrated ore, to better understand the loss of mercury to air versus water/soil.

Example cont.

4 Weigh the sponge gold remaining after burning.

5 If possible, weigh the gold doré after the sponge gold has been melted in order to understand the % of residual mercury remaining in the sponge (often 5%).

Key Information Required

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4. **How much gold is produced?**
5. How many miners are there?
6. How much money do the miners make or spend?

Sources

- Interviews with miners, gold buyers, and other key stakeholders / informants
- Demographic and household surveys
- Counts and observations
- Official reports and trade data

- What is the average income of a miner?
- What is the price of gold?
- What is the division of wealth?
- What are the hours/days of work?

- How much mineral is extracted from a shaft per day/week?
- What is the general cost of living on the mine site?
- What is the average ore grade/gold purity?

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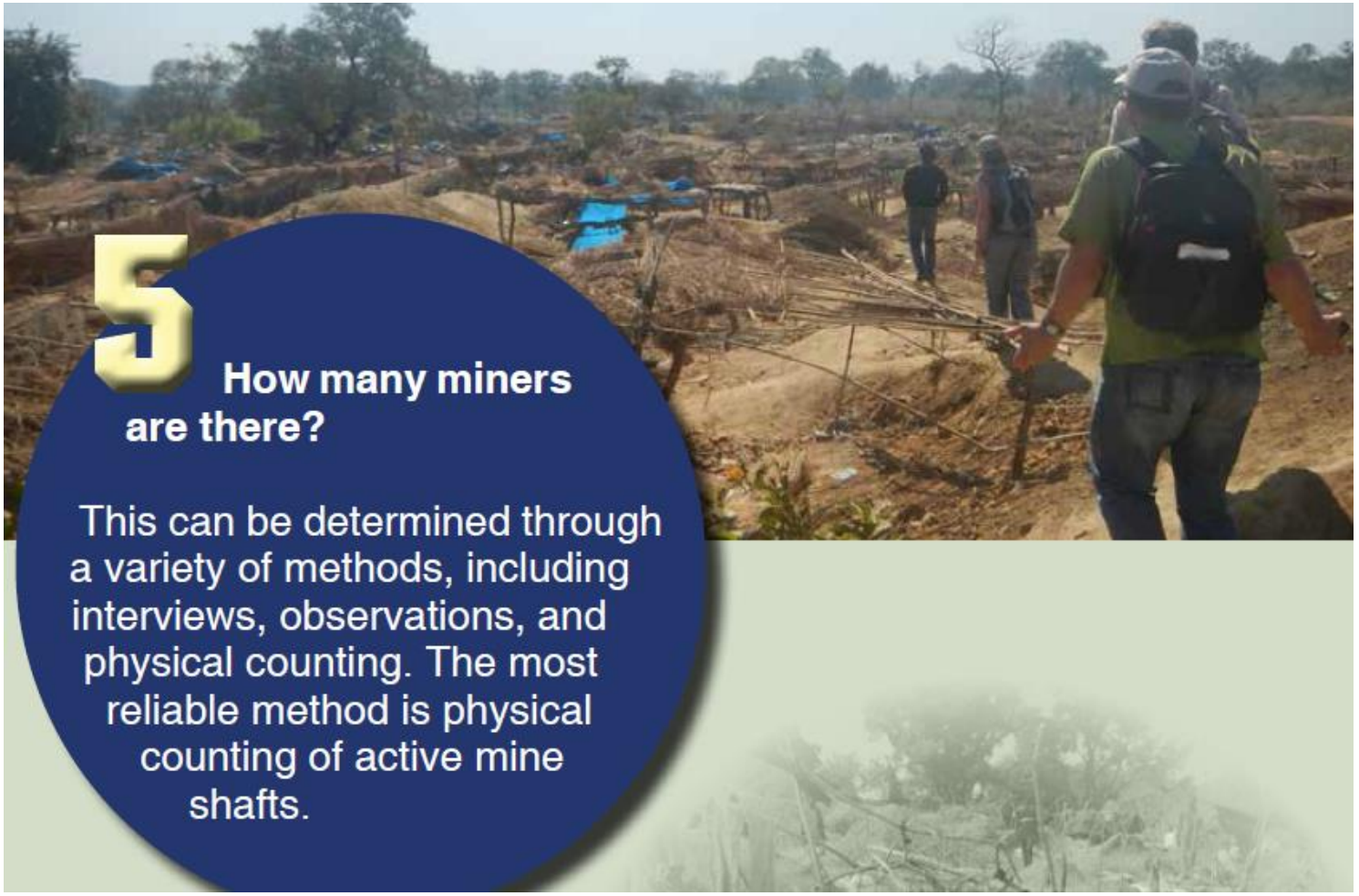

- How many active shafts are there?
- What is the average shaft group size?

Key Information Required

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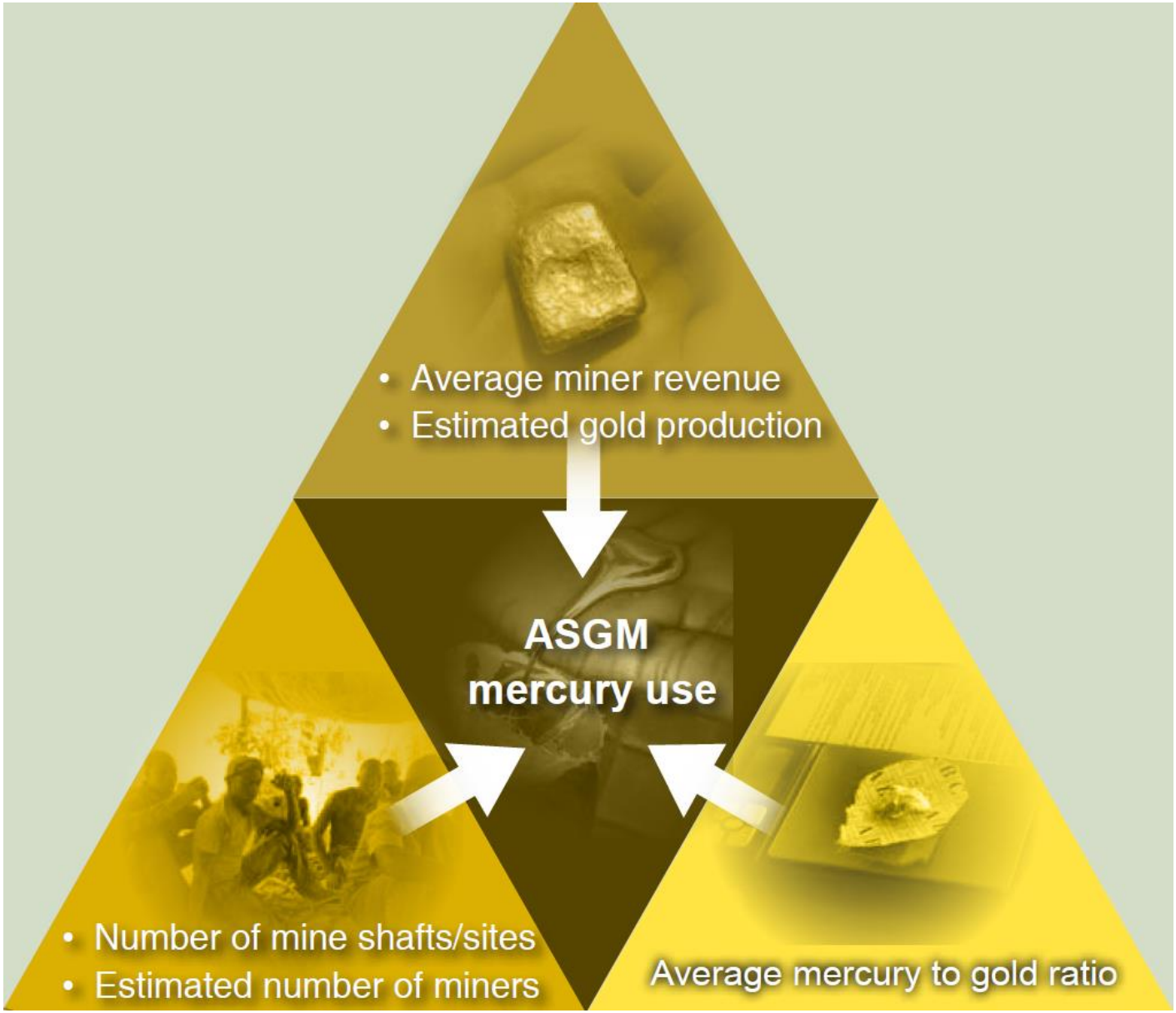
How much do miners make or spend?

This can be determined through interviews with miners, household surveys, and by gaining an understanding of the cost of daily living in the community.

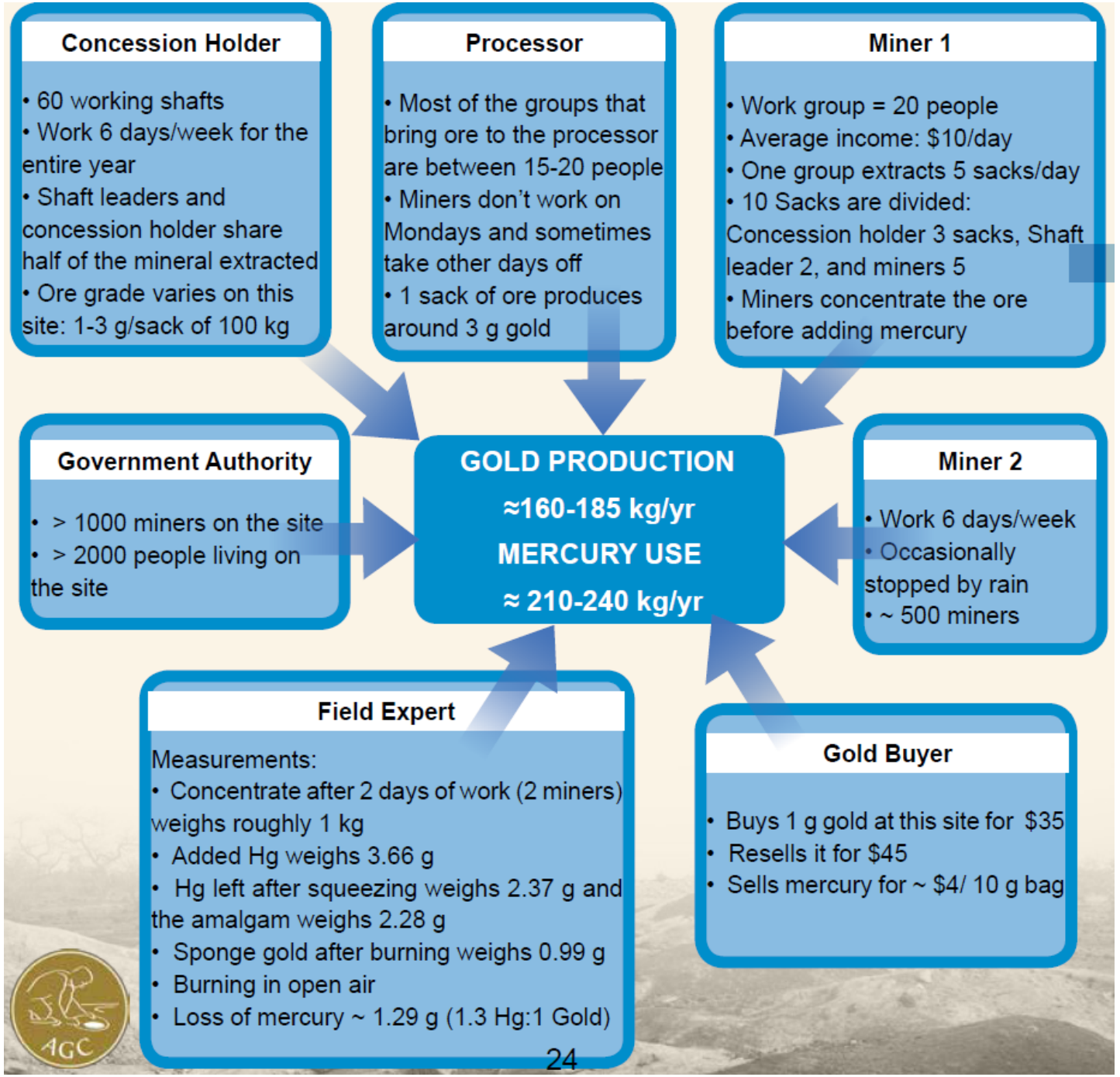
Interviews, Surveys, Cost of Living

- Number of active shafts?
- Number of active mills?
- Cost of using the mill per sack?
- Number of sluices?
- Cost of using sluices?
- Number of gold buyers?
- Price of gold being paid?
- Cost of mercury per bag?
- Number of merchants?
- Number of restaurants?
- Cost of a bottle of water?
- Cost of a soda?
- Cost of a beer?
- Cost of a meal in a restaurant?
- Cost of cigarettes?
- Cost of canned food?
- Cost of a sack of rice?
- Cost of water?

Triangulate



Framework


Concession Holder
• 60 working shafts
• Work 6 days/week for the entire year
• Shaft leaders and concession holder share half of the mineral extracted
• Ore grade varies on this site: 1-3 g/sack of 100 kg
Processor
• Most of the groups that bring ore to the processor are between 15-20 people
• Miners don't work on Mondays and sometimes take other days off
• 1 sack of ore produces around 3 g gold
Miner 1
• Work group = 20 people
• Average income: $10/day
• One group extracts 5 sacks/day
• 10 Sacks are divided: Concession holder 3 sacks, Shaft leader 2, and miners 5
• Miners concentrate the ore before adding mercury
Government Authority
• > 1000 miners on the site
• > 2000 people living on the site
GOLD PRODUCTION
≈160-185 kg/yr
MERCURY USE
≈ 210-240 kg/yr
Miner 2
• Work 6 days/week
• Occasionally stopped by rain
• ~ 500 miners
Field Expert
Measurements:
• Concentrate after 2 days of work (2 miners) weighs roughly 1 kg
• Added Hg weighs 3.66 g
• Hg left after squeezing weighs 2.37 g and the amalgam weighs 2.28 g
• Sponge gold after burning weighs 0.99 g
• Burning in open air
• Loss of mercury ~ 1.29 g (1.3 Hg:1 Gold)
Gold Buyer
• Buys 1 g gold at this site for $35
• Resells it for $45
• Sells mercury for ~ $4/ 10 g bag
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Additional Secondary Information

- Additional Secondary Information can help double check assumptions
  - Production Method
  - Supply Chain
  - Social Aspects and Demographics
  - Services
  - Hygiene and Safety
  - Site Governance

Example Calculation

- **Gold Production**
- 60 shafts and approx. 20 people per shaft, roughly 1200 miners [60 x 20 = 1200] (cross check with other relevant information: Government Authority said 1000, Miner 2 said 1500)
- The grade of the ore is approx. 1-3 grams per 100 kg sack = an average of 2 g per 100 kg sack
- A working group can extract up to 5 sacks of 100 kg/day.
- There are 60 groups, therefore approximately 300 sacks are extracted/day [60 x 5 = 300]
- 300 sacks are extracted/day and the average grade per sack is 2 grams. Approx. 600 grams of gold extracted/day on the entire site [300 x 2 = 600]
- Miners on the site work approx. 6 days/week plus average of 3 weeks off, totaling 270 working days
- 270 working days that produce approx. 300 sacks with an average grade of 2 grams = annual gold production of 162 kg [270 x (300 x 2)
- **Annual gold production of approximately 162 kg**

Example Calculation Cont…

- **Mercury Use**
- Ratio of 1.3:1 (mercury lost : gold produced) verified through
- measurement in the field.
- 162 kg x 1.3 = 210 kg Hg
- **Annual mercury use of approximately 210 kg**
- **Emission Factor**
  - what is emitted to atmosphere (Hg in amalgam) and what is released to soils and water (Hg in tailings)
  - Hg in amalgam = roughly weight of gold in amalgam (162kg)
  - Hg in tailings is the difference: 210-162 = 48.6

- 1-(48.6/162)*100 = **70% to air; 30% to soil+water**

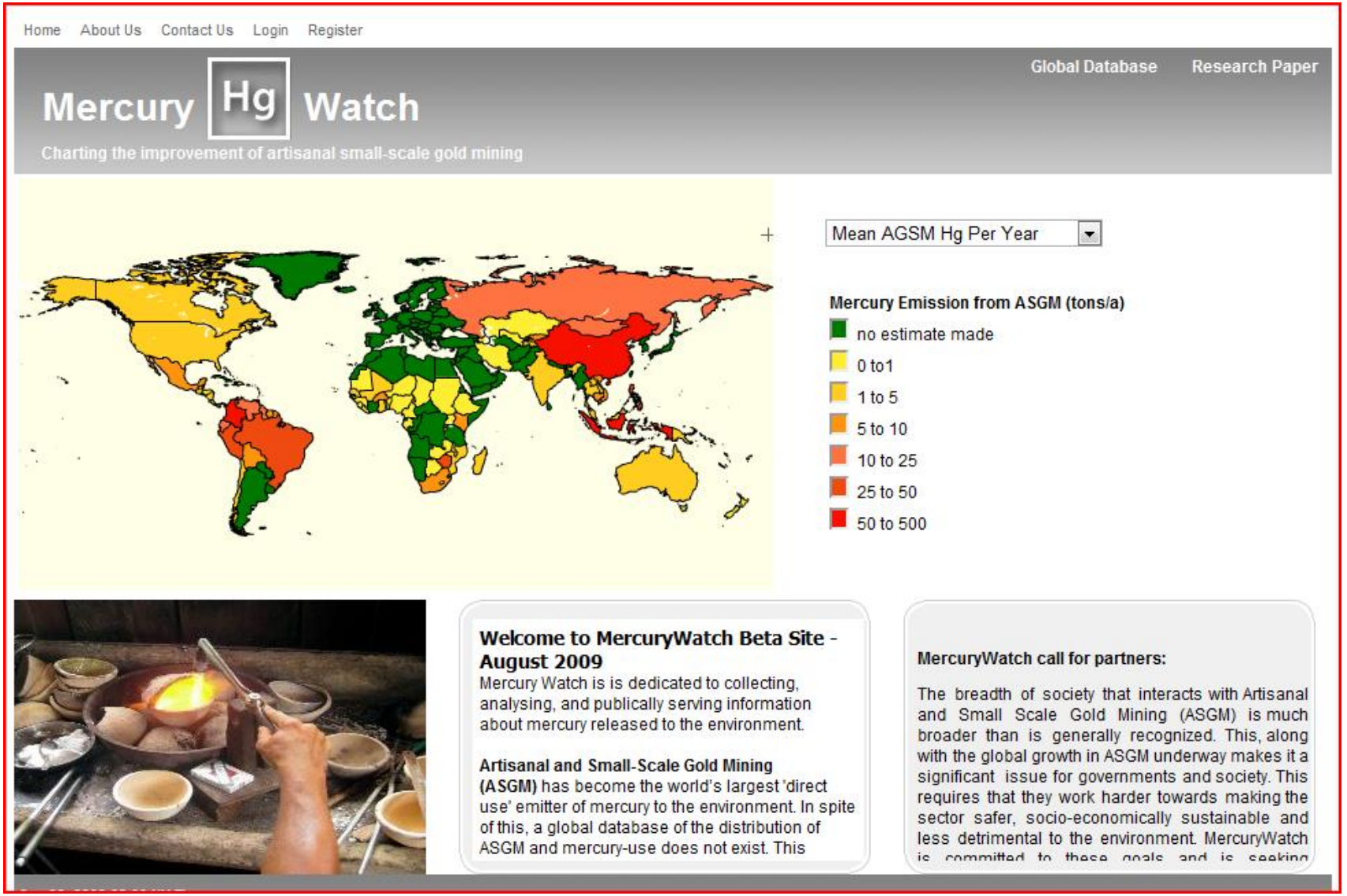
Alternative based on income

- $10/day for a miner ($10 x 1200 miners = $12,000/day)
- $12,000 /day x 270 days= $3,240,000 /year for miners
- Average spot of gold last year = $50/g, and approx. 70% of spot price ($35) is obtained by miners in the field
- $3.24 million /$35 = miners gold production = 92.5 kg
- However this constitutes about half of the production (because the shaft leader and concession holder take half so the total production would be closer to 184 kg
- **Difference between calculations = 20 kg or 12%**
- **Mercury Used per year = 1.3 x 184 = 241**

Mercury Watch Database

create an account and enter your data here

www.mercurywatch.org




Thank You
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