

Artisanal and Gold Mining, 10 million People, 70 Countries size, location, economy, stakeholders, issues

Global Forum on Artisanal and Small Scale Gold Mining
7–9 December 2010
Manila, Philippines



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Where does gold come from?



- Gold Souk – Dubai, 2010

World's largest Golden Ring

- 59 kg 21 carat gold
- Jewelry co of Saudi Arabia; UAE; World Gold Council



Origin of Gold?

- We generally don't know
 - 6000 years of production
 - 140,000 tonnes still in circulation
 - Modern production 2,500 tonnes per year (1.5%)
 - Fungible
- How much was produced from informal Artisanal and Small Scale Gold Mining (**ASGM**)
 - estimates vary; conservatively 5% or 7000 tonnes
- Philippines currently 80%
- 30 tonnes/year



Outline

- Artisanal and Small Scale Gold Mining
 - What it is
 - History and Background
 - Why it is important
 - Size, location, economy, stakeholders, issues
 - Common financial arrangements of ASGM: how gold shops operate
 - Why mercury is a good entry point for accomplishing broader goals
- Types of Solutions

ASGM

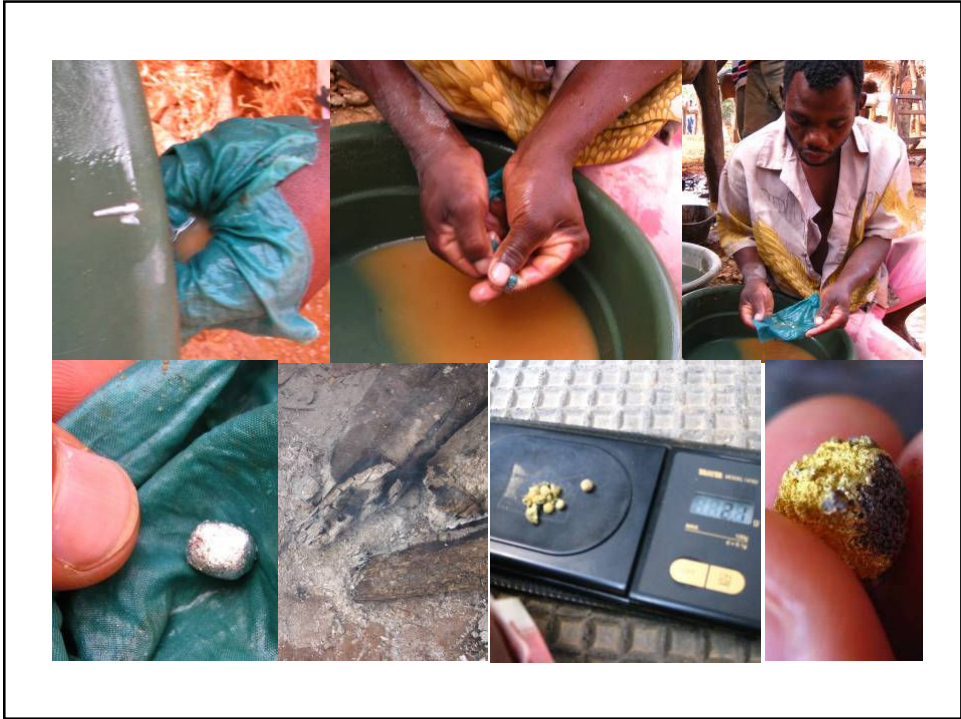
- Exploitation of small deposits
- Low capital input
- Labour-Intensive
- Poor Access to Markets and Support Services
- Low Standards of Occupational Health and Safety
- Significant Environmental Impact

Alluvial ASGM



Alluvial ASGM





Gold Shop Processing - Quartering



- Step 1: separating metals from other minerals . Materials: borax, potassium nitrate, electric airpump gasoline torch, cheap clay crucibles.

Gold Shop Processing - Quartering



Step 2: Purification of gold. Materials: silver, nitric acid, borax, gasoline airpump torch, good crucible



24K
Internationally
Tradable



High intensity whole ore amalgamation



High intensity whole ore amalgamation



Mercury then Cyanide!



Mercury and Cyanide

- Cyanide-Mercury Complexes Released into Environment
- Enhanced Transport
- Enhanced Bio-Availability
- Enhance Volatilization
- Little is published
- **Reputational risk for LSM is large**



Atmospheric Evasion



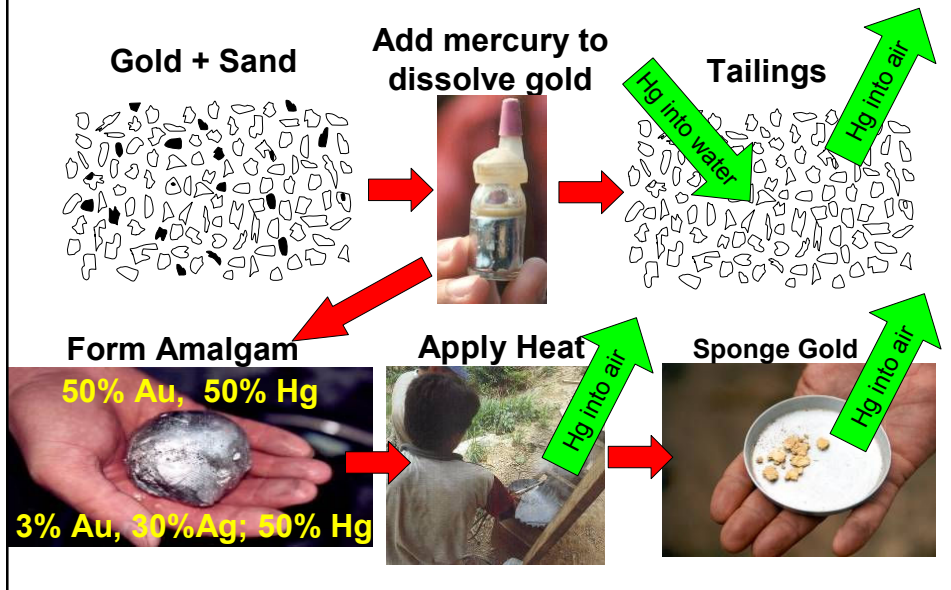
**Aquatic Releases
– Fish?**



Ignorance

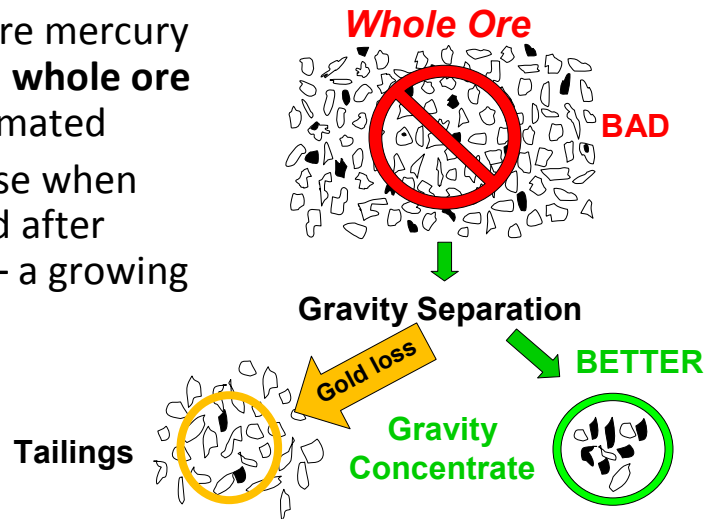


How is Mercury Used and Lost?



Mercury Losses Vary With Style of Operation

- Much more mercury lost when **whole ore** is amalgamated
- Even worse when CN is used after mercury – a growing trend



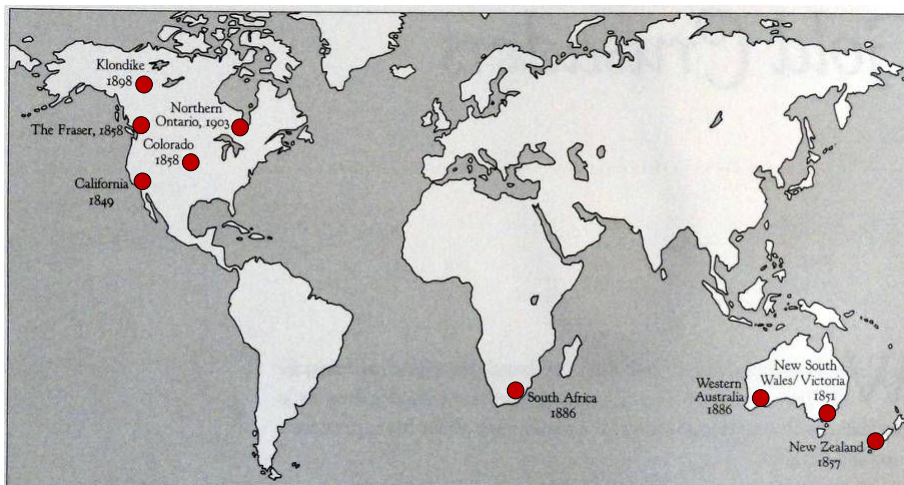
Why is Mercury Used?

- Very easy
- Very independent – 1 person can do it
- Highly effective under field conditions
- Accessible
- Cheap
- Facilitates precise transactions
- Produces quick capital (1 day)
- Divides profits
- Miners are not aware of the risks
- No choice



History of ASM

100 Years Ago



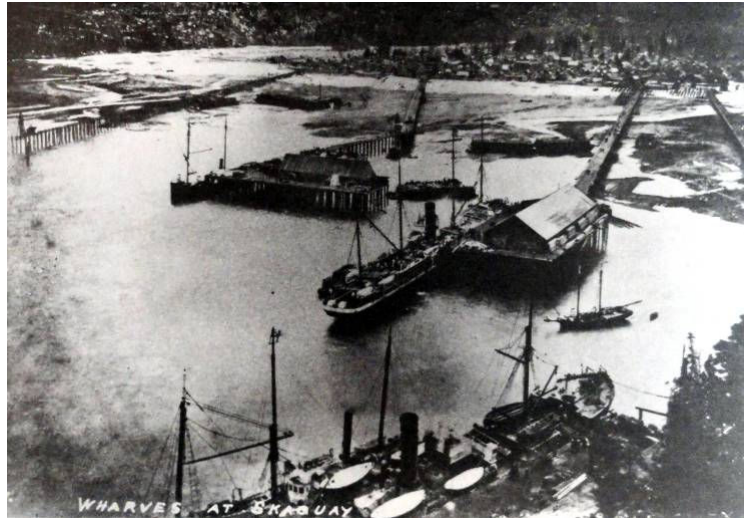
Australia, 1850



Canada, 1890s



Skagway, Juneau, Victoria, Vancouver, Seattle Created



ASM to LSM through Services

- Canada + US + Australia formalised their ASM sectors through provision of services
 - Transportation
 - Communication
 - Technical Services
 - Marketing
 - Capitalisation

Toronto

- **Beginning of modern mining sector based on ASM**
- King Edward Hotel Stock Exchange 1903
- Royal Canadian Mint 1903
- Railway to Cobalt Ontario built
- Newspapers, the Financial Post & Northern Miner were created
- Geological Knowledge began to be heavily employed
- Ontario and Quebec Mineral Sectors were born
- Inco, Noranda, Placer Dome...



Past - Canada, 1890s



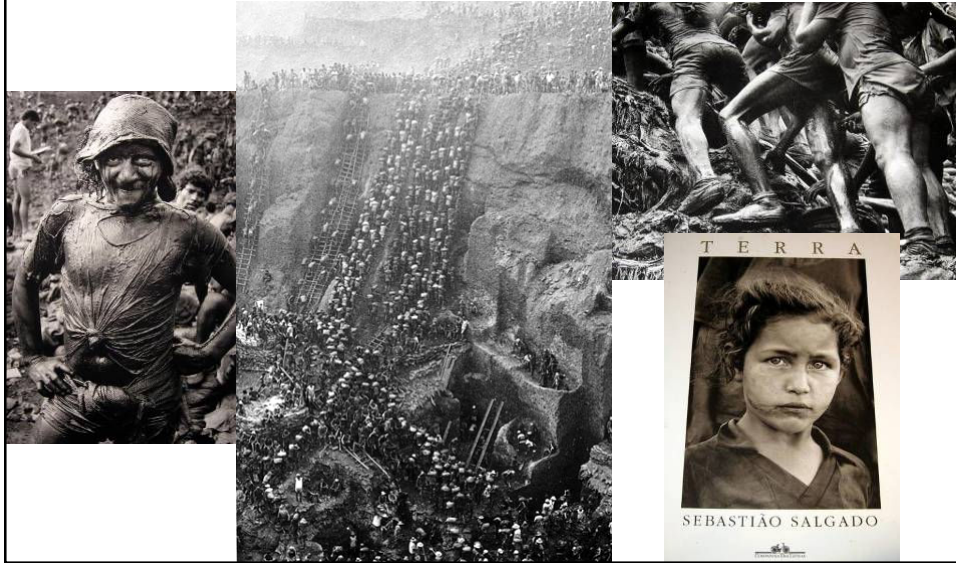
Present - Brazil, 1990s



Present

Modern Times – post gold standard

Serra Pelada (The Naked Hill), Brazil, 1979



Perspectives

- **THE WORLD'S LARGEST GOLD MINE**
- **THE WORLD'S LARGEST EMPLOYER FROM GOLD MINING**
- The breadth of society that interacts with Artisanal and Small Scale Gold Mining (ASGM) is much broader than is generally recognized
- Current ASGM production is around 12% - larger than any single producer
- Risk (reputational and operational) for LSGM (Large Scale Gold Mining) is increasing due to ASGM

Scale and Economy of ASGM

- 330 tonnes of gold from 70 countries
- 10 billion USD at 1000\$/ozt
- 10 million miners (3 million women and children)
- \$1000/miner - unevenly distributed
- Secondary economy, perhaps 50 million people at 50 billion USD/a
- Roughly double the population of Canada at a GDP PPP 40 times lower

Mercury Watch



Consumption/Emission Intensity ASGM vs LSGM

- The Formal Mining Sector out performs the ASGM sector in some areas and vice -versa
 - More energy efficient (joules/unit gold)
 - Release less greenhouse gasses (CO₂e/unit gold)
 - Produce less waste rock and tailings per unit gold
 - Release 5 times more mercury
 - 40 times more mercury per unit of gold produced
 - Those who use CN use about twice as much per unit of gold
 - Do not practice waste management

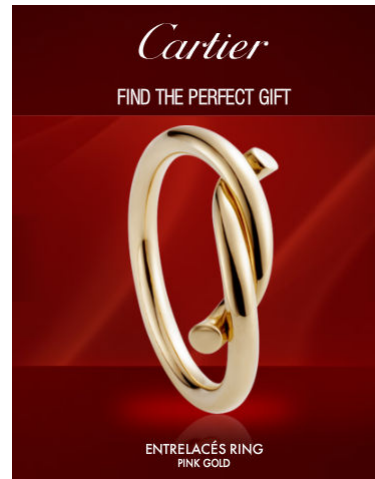
Developed World Involvement

- Juniors to majors; stock exchanges; services to financing
- Billion dollar industry that increasingly interacts with ASGM
- LSM social license to operate impacted
- Emissions of mercury from ASGM impact the developed world



Sign of Change - Cartier

- Cartier is buying gold from a Honduran ASM site to include ASM gold in their supply chain
- Symbolic of the desire to clean up gold mining through the market
- Preservation of brand name



Sign of Change

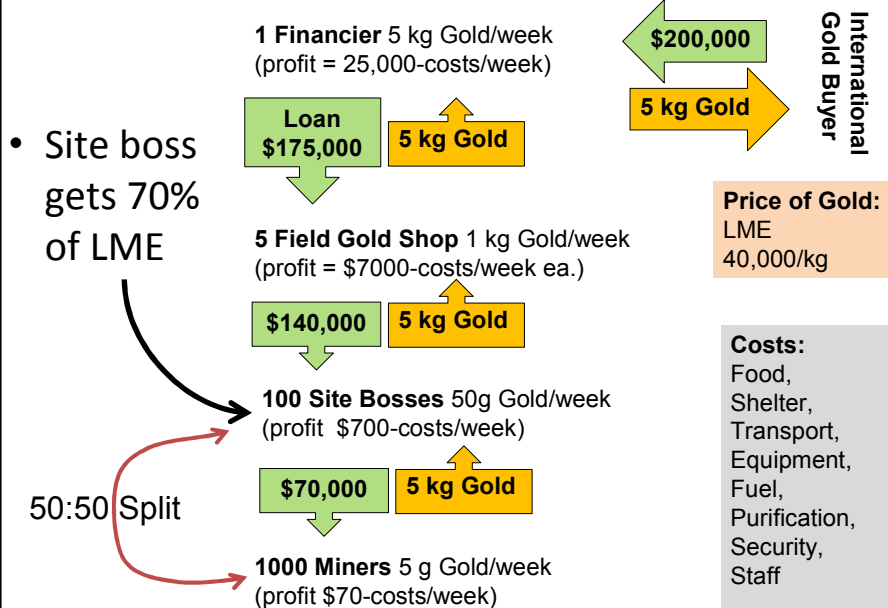
- Using the gold market to incentivize change
– (e.g., Fair Mined/ Fair Trade brands)



Gold in Development / Poverty Relief

- Gold represents an excellent method of transferring wealth from rich to poor countries
- Small producers often get 70% or more of international price in remote areas - This is not true for any other product
- Gold mining is a good development opportunity
- ASGM needs to be brought into formal economy to maximize benefits – but can be a complex problem
- Improved practices and reputation are essential to make this happen
- **Reducing mercury use is key to realizing this opportunity, particularly in light of UNEP's forthcoming Global Mercury Treaty**

Cash Flow Model (70% model)



Mercury as an Entry Point into ASGM Reform

- Aside from reducing mercury pollution, mercury is a good entry point for accomplishing broader goals in ASGM
- Provides Focus
- Provides understandable and concrete goals related to miners health and wealth
- It is about the language of miners
- Success can be obtained and measured

Solutions

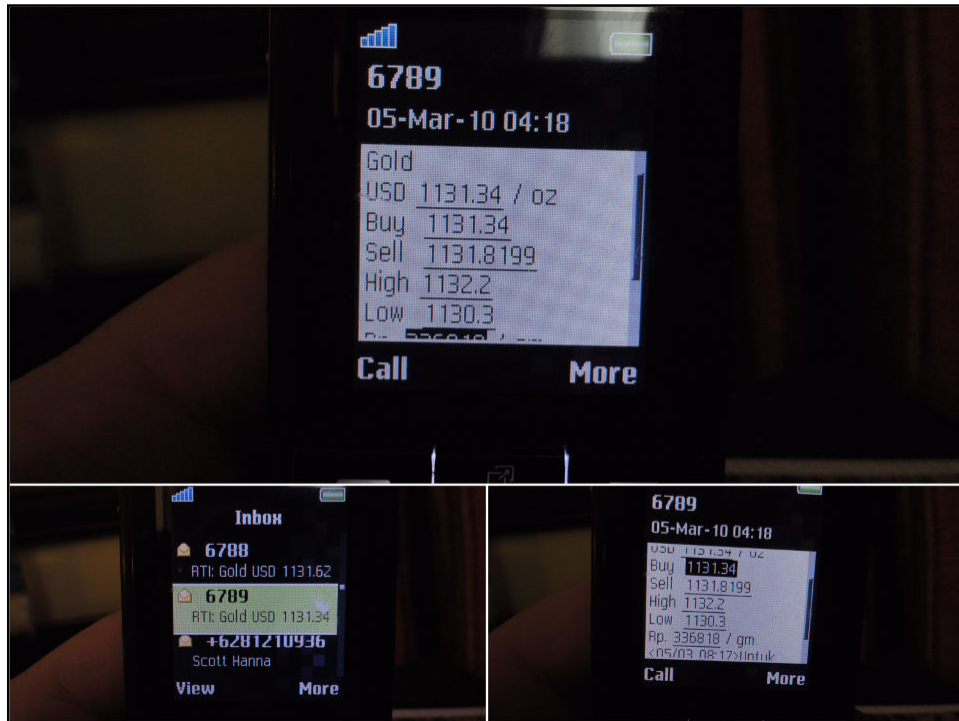
- Technology Transfer
- Financial Mechanisms
- Enabling Policy

Approach to Solutions

- Profit is an important incentive for creating sustainable change in any ASGM operation.
- Asking miners to change their behaviour in a way that induces a pay cut has been universally unsuccessful
- Interventions where better practices have come along with increased profits have thrived
- **Field work is the source of innovation and progress**

Technical Solutions

- Alternative processing:
 - Lower mercury (step 1) - **Mercury Recycling**
 - emissions control (fume hoods, retorts)
 - mercury re-activation
 - Zero mercury (step 2)
 - Gravity separation and or chemical leaching



Who can be Involved in the transition to cleaner gold?

- ASM communities and their local governments
- Multiple national government stakeholders
 - Mining
 - Environment
 - Health
 - Trade
 - Education
 - Treasury (federal gold reserves)
- Gold industry from bottom to top (producers, traders, buyers, nations heavily involved in gold mining)
- Jewellers and luxury goods market

Conclusions

Helping Artisanal Miners to derive the greatest benefit from this development opportunity, while minimizing the environmental and social consequences will require innovation, finance and political will

