

Mercury Releases from Artisanal Gold Mining,  
Industrial Scale Gold Mining and Metallic  
Smelting

USEPA

Office of Solid Waste

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# Artisanal Gold Mining and Mercury Releases

- Artisanal gold is the mining of gold using very primitive non mechanized methods to mine and concentrate gold.
- Mercury has the ability to agglomerate gold particles out of sands. The Chinese were using this recovery method 2000 years ago.
- Large scale artisanal gold mining is currently taking place throughout the Amazon Basin, in Africa. Indonesia, Philippines, Laos, and China.
- There may be over 10 million people involved in artisanal gold mining, with very significant number of women and children actually mining gold and exposed to mercury. Up to 500,000 women and children are involved
- The legal status of mining camps is often vague and there is little or no provision of health services to miners or their families. It is believed that mining camps have very high incidence of HIV/AIDS, TB, and other transmittable diseases.

# Mercury Releases from Artisanal Gold Mining

- It is generally assumed that one ounce of mercury is released into the environment for every ounce of gold produced by artisanal miners.
- UNIDO estimates that up to 1000 tons of mercury a years are release annually from artisanal gold mining.
- Mercury releases from mining camps severely impact area streams, soils, vegetation, and contaminate fish.
- Artisanal gold mining is a major contributor to the long range transport of mercury throughout the world.
- Mercury releases are mainly from the retorting of the mercury gold amalgam using open flame. The amalgam is composed of 60 percent gold and 40 percent mercury.
- Once the amalgam is burned off , it is again fired in gold shops which are also major sources of mercury releases.

# Cyanide Heap Leach Gold Mining

- US is third largest gold producer in the world
- 80 percent of US gold produced in Nevada
- TRI mercury and mercury compound releases  
2004: 4605 pounds point source, 1,374,000  
pounds tailings.
- TRI 2002 mercury and mercury compounds:  
8510 pounds point source
- Nevada Mining Association voluntary program  
addressed releases from autoclaves, carbon  
regen, retort.
- Byproduct mercury often exported.

# Mercury Associated with Metallic Ores

- Mercury is often found mixed with:
  - zinc
  - copper
  - aluminum
  - iron ore
- When smelted mercury is fused off in the furnaces.

# Examples of Mercury Releases

- 2004 Tri
- Big River Zinc point source 545 pounds
- Typical aluminum plant 300-400 pounds
- Typical electric arc furnace NUCOR 600
- Copper smelters (2 operating)

# Why Smelters are Disappearing?

- Hydrometallurgical mining
- The use of liquids to extract and produce solid metal.
- Metals are leached out, then the metal rich solution is concentrated (solvent extraction) followed by electrowinning.
- Electrowinning is the use of electric current to plate metals out of solution onto cathodes.
- Finished product is metal plate-No smelting needed
- PD Safford Arizona pressure copper leach with SX/EW.
- Hydrometallurgical mining now used in gold, copper, nickel, possibly zinc.

# Why Worry about Expanding Metallic Mining in Region 5

- Deposits of copper, iron, gold, lead/zinc are actively being explored in Region 5.
- Proposed copper mine in the UP is in the permitting phase.
- Many deposits have mercury affiliations.
- Deposits may have acid rock drainage risks.
- Reclamation in high snow/high rainfall areas present difficult reclamation challenges.

# Hard Rock Mining Team

- Hard Rock Mining Team is composed of staff from all the Regions and all program offices.
- The Team provides technical assistance and training to Regions, States and Tribes.
- The Abandoned Mine Land Team is a subgroup of the Team and address abandoned mine clean-up issues.
- Mining information can be found at <http://www.epa.gov/epaoswer/other/mining/index.htm>
- Abandoned mine land information can be found at: <http://www.epa.gov/superfund/programs/aml/>