Mercury Migration

Deadly Pathways to Developing and Indigenous Communities

Mercury being mixed in with the gold in the upper pan. Copyright Michael Jorn Mangal

Ending Mercury Use in Artisanal Gold Mining

Since the onset of the modern day gold rushes of the 1970s and 1980s, one of mercury's most significant uses has come from small-scale – or artisanal – gold mining. The use of mercury from mineral extraction processes has virtually been eliminated in developed countries. But mercury use for gold mining in the developing world has increased exponentially with increased demand for gold and with the emergence of new technologies enabling more productive small-scale mining operations primarily in Asia, Latin America and in Africa. The proliferation of artisanal gold mining has led in large part, to a disproportionate burden of mercury toxicity on poor laborers and communities in developing countries.

Historically, gold production from this global prospecting surge surpasses the great gold rushes of the 19th century. Small-scale gold mining at the height of prospecting in the Brazilian Amazon – one of the most prosperous and best documented modern gold rushes – produced around 120 metric tons of gold a year. By contrast, from 1848 to 1856 the California gold rush produced an average of 80 tons of gold annually, while the Klondike produced a total of 42 tons between 1896 and 1900.

To extract gold, artisanal miners combine mercury with gold-laden deposits, or ores at several stages of the recovery process. Gold bonds to mercury, forming a composite known as amalgam that is more dense than the gold dust itself, making the gold easier to collect from the rest of the sediment. Considerable amounts of mercury are left in the sluice tailings or waste from this process and are washed into the environment. The bonded gold-mercury amalgam is heated with blow-torches or over open fires to burn off the mercury, directly exposing miners and other bystanders to mercury vapors. The vapors that escape inhalation settle into the surrounding environment. Both the discarded tailings and the fallout vapor are likely to be metabolized by organic matter, transforming elemental mercury into methylmercury – one of the most toxic organic compounds and a powerful neurotoxin. As methylmercury makes its way up the food chain it bioaccumulates in fish and wildlife, becoming increasingly concentrated and potent.

> ***"The proliferation of artisanal gold mining has led in large part, to a disproportionate burden of mercury toxicity on poor laborers and communities in developing countries."***

- As much as 95 percent of all the mercury used in artisanal gold mining is released to the environment.
- For every gram of gold produced 2-5 grams of mercury are released to the environment.
- This equates to losses of 240 – 600 tons of mercury each year in the Amazon basin alone.

Mercury Migration Series

BAN Hg-WG

1

Mercury Migration Series

Communities At Risk

While it is thought that at least one-quarter of the world's total gold output comes from small-scale gold mining, World Bank reports acknowledge that in certain countries as much as three-quarters of all the gold produced in artisanal operations goes unreported. For many developing countries artisanal gold mining is already the largest single source of mercury emissions. Some experts believe that the amount lost yearly from artisanal gold mining is close to 1000 tons.

Because the full extent of small-scale gold mining is unknown, the toxic toll created by persistent mercury use may in fact be more pervasive than is generally presumed, and the impacts on communities and ecosystems more devastating and deadly. It takes only ½ gram of mercury to contaminate all of the fish in a 25-acre lake. And, for communities affected by rampant use of mercury in small-scale gold mining, the possibility of remediation or clean-up after mercury has already been released is often minimal or nonexistent.

Initially, it is the miners themselves who are at the greatest risk of poisoning from the constant and casual handling of liquid mercury and through the inhalation of highly toxic mercury vapors when mercury and gold are heated. But the longer-term, more pervasive, impacts of methylmercury pollution are equally disastrous for any group living downstream of mining activity, and in particular for indigenous communities relying on traditional subsistence economies of fish, wildlife, and small riverside gardens. Because fish and wildlife are not only primary sources of food but valuable commodities, mercury contamination can provoke the rapid collapse of subsistence economies. Further, alluvial mining technologies exacerbate the fisheries destruction through wide-scale sediment pollution of waterways that can kill fish outright.

A Spiral of Despair

Indeed, indigenous groups in mining areas are reporting typical symptoms of mercury poisoning: rashes and blistering, headaches and dizziness, blurred vision, renal, liver, and kidney damage, and miscarriages. But they are also experiencing high rates of malnutrition caused by severe food shortages. These deficits exacerbate a dangerous spiral: the worse the food shortages the greater the incentive to find jobs that pay money to buy goods to replace traditional food and water sources. Not surprisingly, the availability of gold mining jobs and the lure of increased income draws many people from indigenous communities into artisanal mining, thus increasing the amount of mercury released to the environment.

Entire communities are thereby transformed; traditional skills deteriorate as more people work in gold mining and fewer in the sustainable jobs of fishers and farmers; women are at a high risk of becoming prostitutes in mining towns; alcoholism and gambling increase; malaria and HIV/AIDS spread rapidly; and then, to make matters even worse the mercury leaves the land and waters poisoned making a return to the old ways impossible. Rather than increasing the standard of living, mercury-based artisanal gold mining transforms the social and economic fabric of rural life into an unsustainable spiral of despair.

" Some experts believe that the amount lost yearly from artisanal gold mining is close to 1,000 metric tons."

Expansion Of Third-World Gold Mining

An estimated 13 million people work as artisanal miners, spanning at least 30 countries in Latin America, Africa, and Asia, and contributing to the livelihoods of approximately 80-100 million people. But generally the payoff for miners is minimal. Whereas the market price for gold hovers around $310 U.S. per ounce, artisanal miners earn only a fraction of this amount mining marginal deposits that make each fleck of recovered gold precious.

While artisanal miners extract a broad range of minerals, for many countries gold is by far the largest product of small-scale mineral production. In Ecuador and Ghana, gold mining amounts to two-thirds of all mineral production, while in the Philippines the number is

closer to 90 percent, and in Peru gold mining is almost 100 percent of artisanal mining.

The activities of this so-called informal mining sector occur on the frontiers of society, largely beyond the reach of state control or monitoring. Even in those places where mercury use has been made illegal, controls and enforcement are weak, while corruption and outlaw activity are commonplace.

This growth in artisanal gold mining, and the epidemic mercury use that accompanies it, is fundamentally driven by global economic inequalities that leave people little choice but to seek work in the frequently harsh and dangerous environments to exploit marginal mineral deposits. According to the Mining, Minerals and Sustainable Development Project – a coalition of major mining companies – the number of people working as artisanal miners is likely to rise as economies in certain regions continue to falter. In Zimbabwe and other parts of Southern Africa the number is expected to triple over the next 10 years.

Informal or not, small-scale gold mining is now accepted worldwide as a key revenue stream, relied upon by governments of developing countries to fill, at least temporarily, vast employment gaps without having to provide social services for the millions of people working in the sector. Yet this is an ephemeral benefit that belies the social and environmental time-bomb waiting to explode. As it has in every gold rush throughout history, the gold will inevitably run out, and when it does sustainable jobs like fishing and farming will be irreparably degraded as entire ecosystems are contaminated and damaged by the hunger for more gold.

Mercury Alternatives Do Exist

Many experts conclude that mercury has assumed a central place in artisanal gold mining largely out of a mistaken belief that mercury amalgamation is the only way to capture the elusive yellow metal. As long as demand is high, supply is guaranteed. Mercury easily crosses porous national borders, and enforcement in the frontier is difficult. As a result, even in countries where mercury use is prohibited such bans have so far proven ineffective. Moreover, without a viable solution that includes a set of alternatives, such bans are misguided.

Nevertheless, the devastating toxic consequences, combined with the anticipated expansion of artisanal mining throughout the world, requires that a strategy of eliminating mercury use and emissions be established as a global priority.

Fortunately there *are* numerous alternatives, substitutes and processes in existence that either eliminate or significantly reduce mercury use. To date, however, no serious study has been conducted that assembles the assortment of ideas being proposed by various development agencies, engineers, and academics, in order to determine their applicability in different conditions and scenarios. And, likewise, precious few programs have been launched to proliferate these alternative technologies.

> ***"Rather than increasing the standard of living, mercury-based artisanal gold mining transforms the social and economic fabric of rural life into an unsustainable spiral of despair."***

As a first step, a comprehensive survey is needed of all viable

Alluvial gold mining.
Copyright UNIDO

Mercury Migration Series

alternatives to mercury amalgamation. Then the viability and applicability of these methods must be fully explored. Given the propensity of mercury to find its way into the environment, particularly in the uncontrollable conditions in the field, priority must be given to those technologies that eliminate mercury use altogether.

Going Mercury Free

Such methods do exist and have been successfully field-tested. One mercury-free approach is offered by Dr. David Norman, a professor of geochemistry at New Mexico Tech University. Introduced to artisans mining alluvial gold concentrates in Ghana, the method is technologically simple, cheap, and user-friendly. Collected sand is first panned in a cone shaped wooden bowl. The concentrates are re-panned, or "polished," in a pliable rubber bowl, and then dried completely over a small fire. A magnet is used to remove magnetic grains from the dry concentrate. The remaining sand is placed on a large sheet of paper, and miners blow on the sand, tapping the paper lightly to separate heavier gold from the lighter sand, sometimes employing a magnifying glass to identify grains of gold and a small brush to remove larger grains of the sand. This entire process takes at most 10-15 minutes longer than mercury amalgamation, but the finished product is a brighter, purer gold with greater market value because it is untainted by silver-colored mercury. Most importantly, the process uses no mercury and thus poses no health risk either to artisanal miners or to downstream communities.

Another alternative approach that can substantially reduce the amount of mercury released is by utilizing retorts during the mercury burn-off stage. Retorts costing around 25 U.S. dollars, are simple to operate, and allow for reuse of captured mercury, but are rarely used by artisanal miners. Similarly, one United Nations pilot program has experimented with locally owned and operated processing centers that centralize the vaporizing of mercury to limit the exposure both to miners and the environment. Retorts and processing centers potentially reduce pollution rates by containing mercury in a closed loop, minimizing exposure and capturing it for reuse. As much as 95 percent of the mercury can be captured in this way, and 5-10 percent more gold recovered.

Practitioners of these alternatives all stress that the biggest obstacle preventing a transition away from mercury use to alternative methods is neither technological nor economic, but rather it is the educational barriers to be broken to supplant now-institutionalized habits.

The pervasiveness of mercury amalgamation in artisinal mining is not an inevitability. Rather, influenced by lowering mercury prices and a worldwide surge of gold mining, it is an historical choice that has turned habitual. Converting gold miners to mercury-free alternatives requires reducing demand and supply simultaneously. Demand must be reduced through grass-roots, on-the-ground education campaigns, while supply must be reduced through legislation that steadily restricts importation and availability. A complete international strategy, then must include the following four progressive steps:

1. Conduct a thorough survey of alternatives to mercury amalgamation.
2. Conduct a global assessment of these alternatives to ascertain their effectiveness and limits to application.
3. Conduct coordinated grass-roots education programs in mining areas.
4. Legislate restrictions in the importation and trade in mercury.

In this way, we can put a halt to this deadly chapter of toxic mercury proliferation that disproportionately poisons the poor of the developing world.

The Ban Mercury Working Group

The Ban Mercury Working Group (Ban Hg-Wg) is an international network of activists working to end pollution from the toxic metal — mercury. The Mission of the Ban Hg-Wg is to participate collectively to ensure that:

- ***Use of mercury is phased out in both the South and the North and all new mining must cease;***
- ***Mercury releases from all sources are subject to continuing minimization, and ultimate elimination as feasible;***
- ***Commodity transactions and global trade in mercury must be reduced and then eliminated;***
- ***Long-term storage facilities must be created to assure environmentally sound storage of existing quantities of mercury; and***
- ***In the interim, the South must not become a dumping ground for mercury-based technologies, products and/or wastes.***

Web: www.ban.org/Ban-Hg-Wg

BAN Hg-Wg

The Ban Mercury Working Group Secretariat

c/o BAN
1305 4th Ave., Suite 606, Seattle, WA., USA. 98101
Tel: 1.206.652.5751
Fax: 1.206.652.5750
E-mail: info@ban.org
Web: www.ban.org/Ban-Hg-Wg

Printed with non-toxic soy-bean based inks on 100% post-consumer recycled paper.