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Global Mercury Project

Project EG/GLO/01/G34: Removal of Barriers to Introduction of Cleaner Artisanal Gold Mining and Extraction Technologies

An Island of Prosperity in A Sea of Poverty

Small-scale or **Artisanal gold mining** is an essential activity in many developing countries as it provides an important source of livelihood, particularly in rural regions where economic alternatives are critically limited.

Artisanal mining encompasses small, medium, informal, legal and illegal miners who use rudimentary processes to extract more than 30 different mineral substances worldwide.

The International Labour Organization (ILO) estimates that the number of artisanal miners is currently around 13 million in 55 countries and rising, which suggests that 80 to 100 million people worldwide depend on this activity for their livelihood. As it is easy to transport across borders and easily sold, **gold** is by far the main metal being extracted.

Continent	Number of miners (million)
Asia/Pacific	6.7 - 7.2
Africa	3.0 - 3.7
Latin America	1.4 - 1.6
Developed countries	0.4 - 0.7
Total	**11.5 - 13.2**

Employment in artisanal mining (ILO, 1999)

Worldwide it is estimated that as much as 2.5 million women and 250,000 children are directly employed in artisanal mining. Most children work to support their families. Although parents are often aware of the hazards for children involved in mining, in the absence of economic alternatives, child labour will inevitably persist.

Serra Pelada. About 80,000 miners extracted 90 tonnes of gold from a single pit in the Brazilian Amazon (Photo: A. Bernadelli)

Artisanal Miner in Ghana with her baby (Photo: UNIDO)

Although mercury use is illegal in most countries, amalgamation is the preferred method employed by artisanal gold miners. Mercury emissions from these activities are derived from poor practices, lack of knowledge about mercury toxicity and insufficient access to appropriate techniques. Environmental and health impacts resulting from the misuse of mercury and their effects on international waterbodies require coordinated actions and global responses.

GMP News is a quarterly newsletter of the Global Mercury Project.

GMP is a collaborative initiative of GEF, UNDP, UNIDO and participating countries to assist to reduce mercury emissions from artisanal gold miners. The project is executed by UNIDO.

Environmental & Health Problems

Artisanal mining activities are frequently accompanied by extensive environmental degradation and deplorable socio-economic conditions, both during operations and well after mining activities have ceased. Typical environmental impacts caused by disorganized artisanal mining activities include diversion of rivers, water siltation, landscape degradation, deforestation, destruction of aquatic life habitat, and widespread mercury pollution.

Since amalgamation is simple, cheap and does not require skilled labour it is the gold concentration method most used by small-scale miners. Amalgamation employs metallic mercury to trap fine gold. The extent of mercury losses from a specific site is primarily determined by gold-mercury separation procedures. Mercury is often discharged with contaminated tailings and/or volatilized into the atmosphere. Despite the existence of safe procedures to decompose amalgams, the usual practice is to burn the amalgam in a pan or shovel with a blowtorch. When this happens, mercury is accumulated in the lungs and kidneys of miners or citizens living near mines or gold shops (places were gold is melted and sold).

Metallic mercury discharged into the environment (air, water, tailings) can be transformed by biochemical processes into methylmercury, which is readily bioavailable and may be found at elevated concentrations in higher levels of the food chain, particularly in aquatic systems (i.e. it is biomagnified). Individuals reliant on fish (especially carnivorous) as a primary food source may be particularly susceptible to accumulation of dangerous levels of methylmercury. In cases of acute intoxication, muscular atrophy, seizures and mental disturbance are prominent. Methylmercury is easily transferred from women to the fetus, with effects ranging from sterility, spontaneous abortion, and from mild to severe neurological symptoms.

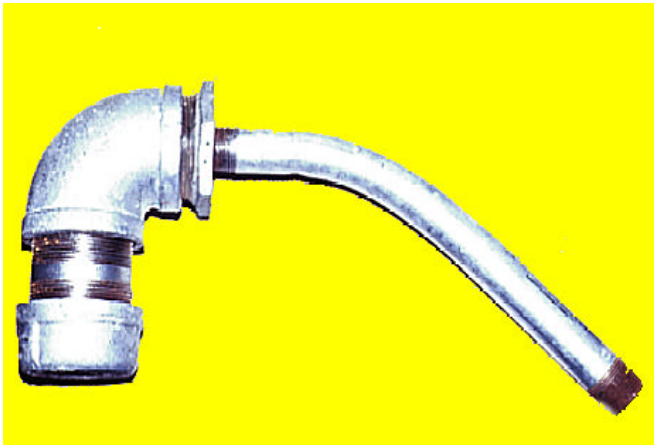
Methylmercury (CH_3Hg) poisoning was first identified in the early 50s by an infamous incident at Minamata Bay, Japan in which a plastic factory was discharging CH_3Hg into the river and bay. Up to 1997, almost 3000 victims have been compensated and 1246 deaths were recognized.

Local people living near hot spot areas must be advised about the risks of consuming mercury polluted fish

Venezuelan Miner burning amalgam to separate gold from mercury (Photo: UNIDO)

Due to the importance of amalgamation, convincing miners to use less mercury because of health hazards is difficult. Lack of sanitation, widespread disease (malaria, cholera, STDs, etc.) and limited access to health care providers have resulted in generally poor health conditions in artisanal mining communities. Consequently, any program directed at reducing the comparatively invisible health impacts from mercury will be received with minimal success if the program does not comprehensively address these community issues also.

As women have little knowledge of the hazards associated with mercury, they are often selected to work in the processing aspect of gold mining (including amalgamation). Women are also predominantly responsible for food preparation, and as women of childbearing age and children are particularly susceptible to methylmercury exposure from fish, educational programs should be specifically directed towards them.



Retorts can reduce drastically mercury emissions
Home-made retorts are not expensive. They can be made with water pipes and connections
(devised by R. Hypolito)

Project Objectives

Since 1995, UNIDO has been providing technical assistance to the small-scale mining sector in developing countries. Through numerous projects dealing with the introduction of cleaner technologies and mercury pollution abatement, the Organization has assessed the environmental and health impacts of mercury pollution caused by artisanal gold miners, *inter alia* in Venezuela, Ghana and Philippines. In the meantime, UNIDO has received new requests from countries in Latin America, Africa and Asia. Whilst the environmental and health problems related to small-scale gold mining have been largely ignored to date, it is now widely accepted that problems associated with artisanal gold mining in different developing countries are similar in nature. As such, solutions need a globally consistent and effectively coordinated approach in order to deal with these complex problems on a local level.

Kids using mercury to extract gold in Suriname (Photo: UNIDO)

In August 2002, the GMP (Global Mercury Project) was initiated to help demonstrate ways of overcoming barriers to the adoption of best practices, waste minimization strategies and pollution prevention measures that limit contamination of the international waters. The Project funded by GEF and co-funded by UNDP and UNIDO is complemented by a suite of ongoing activities which are financed through either the participating countries' resources and/or bilateral programs.

Women and children panning for gold in Laos (Photo UNIDO)

UNIDO has conducted preliminary investigations in the six participating countries (**Brazil, Indonesia, Lao PDR, Sudan, Tanzania** and **Zimbabwe**) in order to establish the intensity of artisanal mining activities and their impacts on the international water bodies.

Within these six countries, available figures show that nearly 2.0 million people are directly involved in artisanal mining activities. The number of those whose livelihoods depend on these activities is over 10 million.

The proposed activities aim at removing barriers that inhibit artisanal miners from applying cleaner and efficient technology. Efforts will be undertaken to demonstrate the application of these techniques and conduct training for the miners to reduce pollution and minimize waste resulting from the currently poor procedures.

The main goals of the Project are:

- reduce mercury pollution caused by artisanal miners on international waters;
- introduce cleaner technologies for gold extraction and train miners;
- develop capacity and regulatory mechanisms within Government that will enable the sector to minimize mercury pollution;
- introduce environmental and health monitoring programs;
- build capacity in local laboratories to assess the extent and impact of mercury pollution beyond the 3-year project life.

As part of a large awareness program, educational campaigns and pilot units will be established to demonstrate the efficiency and advantages of cleaner technologies.

Activities August – December 2002

- ✓ Signature of Project Endorsement by authorities of the 6 participating countries (Brazil, Indonesia, Lao PDR, Sudan, Tanzania and Zimbabwe).
- ✓ Project coordinator (CTA) and staff recruited.
- ✓ Recruitment of small-scale mining expert.
- ✓ Nomination of Country Focal Point in the six participating countries.
- ✓ Identification of local and international project consultants.
- ✓ Visits to possible collaboration institutions: Geological Survey of Japan, National Institute of Minamata Disease, Kumamoto University, British Geological Survey , BRGM/France, CETEM/Brazil, Medical Research Council and MINTEK/South Africa and various institutions in Zimbabwe.
- ✓ Project objectives presented to stakeholders in the 6 countries.
- ✓ Most demonstration sites selected.
- ✓ Participation in International Workshops and Conferences dealing with international waters/small-scale mining/mercury pollution in China, Peru, Cameroon, Tanzania, Switzerland and Brazil.
- ✓ Country Task Force Meeting in Jakarta.

Plans for January – July 2003

- Invitation to competitive biding on environmental and health assessments in hot spots areas (invited parties are Geological Surveys of Japan, United Kingdom and USA, Centro de Tecnologia Mineral of Brazil and Bureau de Recherches Géologiques et Minieres of France).
- Workshop in January with mercury experts from Brazil, France, Germany, UK, Japan and Canada to establish monitoring methodologies.
- Elaboration of a comprehensive document to standardize environmental and health assessment methodologies to be used in all six participating countries.
- Presentation of the Global Mercury Project at mining related workshops organized by UNCTAD in Addis Ababa (Feb.), World Bank in Bali (Mar), and at the World Water Forum, Kyoto, Japan (Mar.).
- Purchase of project vehicle in Sudan and Zimbabwe.
- Recruitment of social science experts in all six countries to assist the environmental and health assessment group.
- Final selection of project demonstration sites.
- Publication of scientific papers in international journals and a book with the monitoring protocols for mercury in artisanal gold mining areas.
- Production of digital promotional material to promote clean technologies for artisanal gold miners based on UNIDO experience.
- Elaboration of GMP website
- Start the environmental and health assessment fieldwork

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