



S1_11

Mercury



Why is Mercury so special ?

Only metal liquid at standard conditions of temperature & pressure

Used in temperature and pressure measuring equipment

Forms amalgam with a number of metals

Used in a number of industrial process and products

Used in dentistry

Highly toxic, especially in its organic form



Mercury



Toxicity

Mercury vapour

- damages nervous system
- damages kidneys
- causes insomnia
- causes tremors
- causes depression
- causes gum disease

• Case: Gold Shop in Vittoria (Brazil)

- raw gold has mercury left in it
- artisanal goldshop on 1st floor burns gold to extract mercury
- vapors of mercury go to the 2nd floor
- after breathing the vapors for 10 years, 2nd floor resident suffers
- his nervous system is destroyed



Mercury



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Mercury



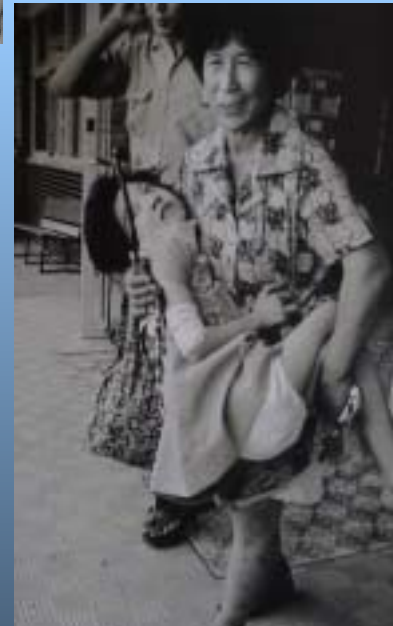
Toxicity

Mercury vapour

Methyl Mercury

Minamata disease

- causes severe neurological damages
- causes ataxia, muscular atrophy, contraction of visual field, speech impairment, tremor, hearing impairment, mental disorder, infertility
- penetrates the placental barrier causing spontaneous abortion, babies are born with severe neurological symptoms or mental deficiency





Mercury

Toxicity



Mercury vapour

Methyl Mercury

Liquid Mercury

- has low toxicity





Mercury



International Response to Mercury Governments

removal of mercury thermometers in hospitals

removal of dental amalgams

replacement of mercury in industrial processes (chloralkali plants...)

replacement of mercury in products (batteries...)

ban of mercury amalgamation in industrial gold mines



Mercury



International Response to Mercury International Organisations

International Conference on Mercury as Global Pollutant in Rio de Janeiro in 1999

UNEP Global Mercury Assessment (2002)

UNIDO Global Mercury Project (2002 – 2008)

UNEP Global Mercury Partnership (2008 – on going)



Mercury



Why should we intervene?

Natural sources (1,400t/a)*

- Volcanoes
- Forest fires
- Volatilisation from the ocean
- Emission from melting icecaps

Anthropogenic sources (3,000 t/a)*

Intentional Use

- Artisanal and small-scale gold mining (1,000t/a)**
- Chloralkali processing
- Mercury used in products

Non intentional release

- Coal Combustion (1,400t/a)
- smelting
- Waste incineration

* Global Mercury Assessment - 2002 estimate

** UNIDO 2004 estimations



Mercury



Where can UNIDO intervene?

Natural sources (1,400t/a)*

- Volcanoes
- Forest fires
- Volatilisation from the ocean
- Emission from melting icecaps

Anthropogenic sources (3,000 t/a)*

Intentional Use

- Artisanal and small-scale gold mining (1,000t/a)** 1/3rd!
- Chloralkali processing
- Mercury used in products

Non intentional release

- Coal Combustion (1,400t/a)
- Smelting
- Waste incineration

* Global Mercury Assessment - 2002 estimate

** UNIDO 2004 estimations



Mercury



Where can UNIDO intervene?

Artisanal and small-scale gold mining (ASM)

- provides livelihood for an estimated 10-15 million people all over the world
- major global source of mercury contamination
- artisanal gold miners:
 - produce an estimated 800 tonnes of gold annually
 - release as much as 1000 tonnes of mercury to the environment annually

* Global Mercury Assessment - 2002 estimate

** UNIDO 2004 estimations



Mercury



Where can UNIDO intervene?

Artisanal and small-scale gold mining (ASM)

- Working with miners, artisans to introduce simple technologies and know how
- Working with governments of developing countries:
 - to improve policy and legislation
 - to protect and formalize sector
 - to target education and health care

* Global Mercury Assessment - 2002 estimate

** UNIDO 2004 estimations



Mercury



Where can UNIDO intervene?

UNIDO's Global Mercury Project (GMP)

- Target: Artisanal and small-scale gold mining (ASM)
- Countries: Brazil, Indonesia, Lao PDR, Sudan, Tanzania, Zimbabwe
- Pilot Phase 2002-2007 with GEF financing
- Total project cost: US\$ 21.3 million
 - (GEF Grant US\$ 6.8 mil & Co-finance: US\$ 14.5 mil)
- Study areas all located in key trans-boundary river/lake basins
- In these areas ASM involves nearly 2 million people, and supports more than 10 million dependents
- <http://www.globalmercuryproject.org>

* Global Mercury Assessment - 2002 estimate

** UNIDO 2004 estimations



Mercury



Artisanal Gold Mining Problem

What happens when Mercury gets in the water?

Amalgamation of
the Whole Ore

and/or

Cyanidation of Hg-
contaminated tailings



Huge Hg losses, large
environmental problem



Hg⁰

CH₃Hg in fish

Hg⁰ vapor

lungs

Burning
Amalgams in Pans



Health problem for miners,
family and neighbors



Mercury

Artisanal Gold Mining Problems



Tanzania, 2000



Zimbabwe, 2005



Vietnam, 1995



Cambodia, 2006



Mercury



Artisanal Gold Mining Problem



- Case: Tanzania
 - irresponsible digging to find 1-2 grams of gold is common
 - leads to deforestation & massive destruction of the environment
- Solution:
 - teach methods for mining without degrading the environment



Mercury



Artisanal Gold Mining Problem

- Case: Zimbabwe
 - mixing dirt with mercury on plated pan
 - creating amalgam
 - this method releases mercury in nearby rivers
 - rivers carry the mercury into fish and other organisms

- Solution

- teaching know-how to miners in order to avert mercury going into rivers





Mercury



Artisanal Gold Mining Problem



- Case: Venezuela
 - amalgam is placed in a shovel
 - it is burned to obtain gold
 - this person is in the kitchen of his house!
- Solution:
 - teaching ways to recover mercury with simple utensils, such as a “retort”



Mercury



Artisanal Gold Mining Problem

- Case: Cambodia
 - amalgam burned in a pan
 - children and women are present
 - vapors are inhaled by all





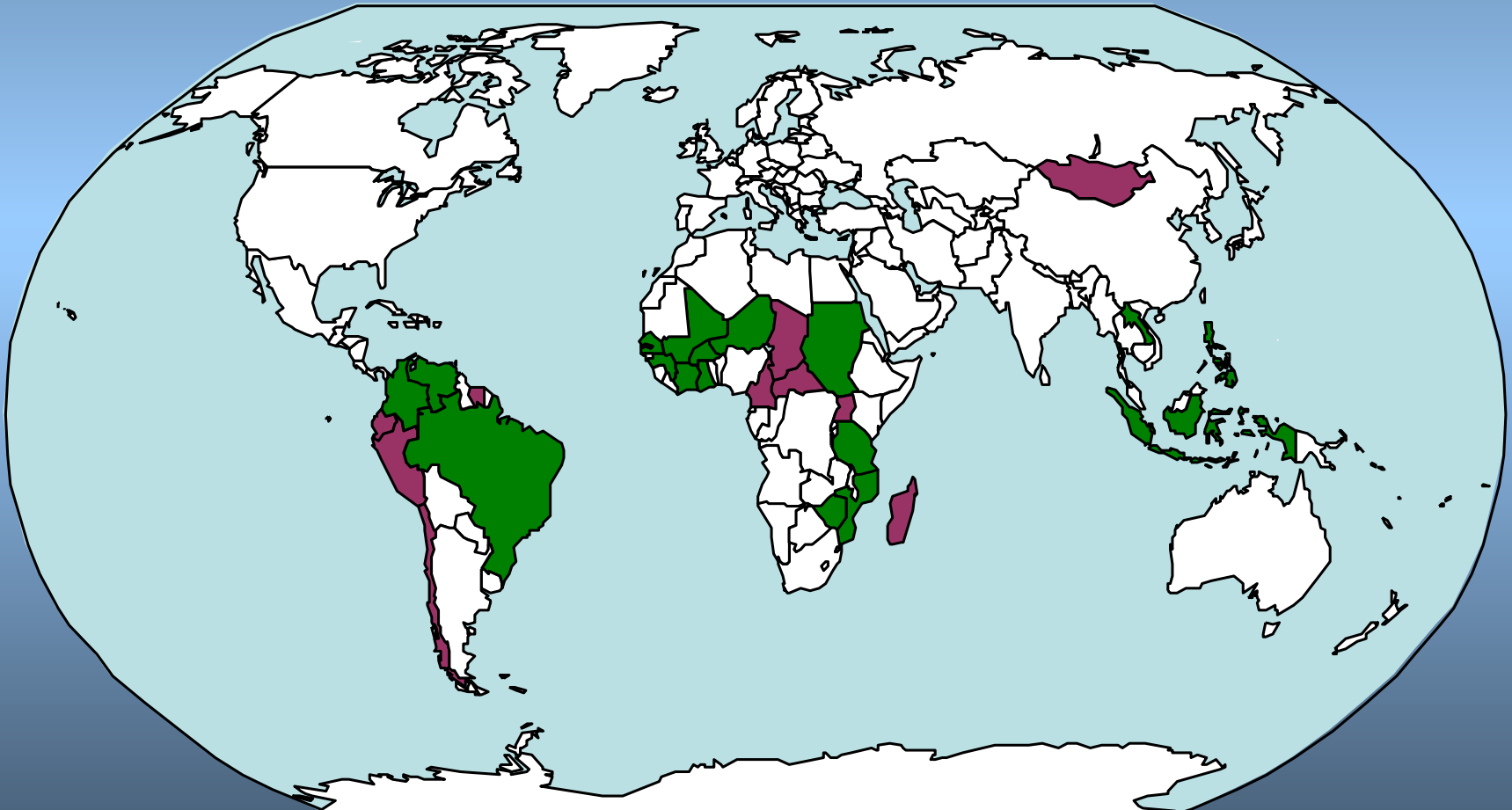
Mercury



Artisanal Gold Mining Projects

2nd Phase project with GEF now under planning

Countries: Green (with past UNIDO intervention) Purple (newly added)





Mercury



Chloralkali plants
Production of chlorine and caustic soda

Mercury cells were extensively used in the past

Only a few sites still use this process

UNIDO could assist in transferring alternative technologies (recently proposed by our field office in Mexico)



Mercury

Mercury in Products / Waste



UNEP Global Mercury Partnership areas

Partnership with Cleaner Production Centres



Mercury



Mercury in Products / Waste

SAICM Quick Start Programme in Uruguay

Project: Sound Management for Mercury Products

Objectives: Ensure proper management and proper disposal of mercury containing products, in particular lamps

Proposed outcomes:

- National sources inventory & quantification of Hg releases
- National Hg lamps assessment, with a life cycle analysis
- Report on life cycle analysis of lighting alternatives
- Guideline of good practices in the management of Hg lamps, with a Cleaner Production approach
- Proposal for a National Plan for the management of Hg lamps
- Document outlining the findings of the regional survey on the management of products containing mercury, in particular mercury lamps
- National and regional publication of the results of the project



Mercury



Outreach - Collaboration

- ILO
 - Mining legislation
 - Child labour in mining sites



Mercury



Outreach - Collaboration

- ILO

- UNEP

Global Mercury Partnership area on artisanal and small-scale gold mining (Lead = UNIDO)

Global Mercury Partnership area on mercury containing wastes (Lead = Japan)

Global Mercury Partnership area on mercury in products (Lead = USEPA)

SAICM Quickstart Projects in Asia and Latin America



Mercury



Outreach - Collaboration

- ILO

- UNEP

- USEPA

Fume hoods in gold shops in Brazil

Awareness raising workshop in Francophone Western Africa

Project development in Peru



Mercury



Outreach - Collaboration

- ILO
- UNEP
- USEPA
- WHO

Health-related awareness campaigns in the field
Treatment of mercury intoxicated miners



Mercury



Outreach - Collaboration

- ILO
- UNEP
- USEPA
- WHO
- Academia (UBC, University of Aachen, University of Montpellier...)
 - Development of mercury-free gold processing techniques



Mercury



Outreach - Collaboration

- ILO
- UNEP
- USEPA
- WHO
- Academia
- GESAMP Joint Group of Experts and the Scientific Aspects of Marine Environment Protection



Mercury



Conclusions

In the next few years, mercury trade will be banned by the US and the EU Governments – **UNIDO should assist artisanal gold miners to transfer to alternative technologies before mercury becomes too expensive**

Artisanal gold mining and mercury-containing wastes are the only sources of mercury for which no reduction of emissions is foreseen – **UNIDO has a major role to play in both sectors**