



**PARTICIPATORY RESEARCH AND ACTION GUIDE TO  
MONITORING MERCURY USE IN ARTISANAL AND  
SMALL-SCALE GOLD MINING IN THE PHILIPPINES:  
A COMMUNITY-BASED MONITORING APPROACH**



Participatory Research and Action Guide to Monitoring  
Mercury Use in ASGM Artisanal and Small-scale Gold  
Mining in the Philippines: A Community-based  
Monitoring Approach

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BAN Toxics is an independent non-government environmental organization that works for the advancement of environmental justice, health and sustainable development in the area of chemicals and wastes, with a special focus on women, children and other marginalized sectors.

We work closely with government agencies, communities and civil society at local, national and international levels to reduce and eliminate the use of toxic chemicals and support global sustainable development goals through education campaigns, community grassroots interventions, training and capacity-building, policy research and development, and advocacy programs.

[www.bantoxics.org](http://www.bantoxics.org)

# FOREWORD

An underwater miner spends hours breathing only through a suction hose attached to a compressor to gather auriferous gravel and sand, in the hopes of finding ores washed away from the mountains to the river. He risks damaging his lungs permanently and even losing his life. All in exchange for an amount, which can barely meet his family's needs for the day. And he needs to do this again the next day.

We at FPE recognize that it is poverty and poor resource management that leaves our communities with no choice but to engage in difficult and life-threatening livelihoods such as artisanal and small-scale gold mining (ASGM), usually using mercury, to meet basic needs on a day-to-day basis.

FPE longs to see its partner communities engaging in livelihoods that pose the least threat to their health, their children's and the environment. It is in this context that FPE supported BAN Toxics on a mercury monitoring project in various ASGM sites in Luzon.

FPE believes in the power of communities and invests heavily in community-driven conservation initiatives in the Philippines. Ultimately, we want our community partners to be fully informed and well-capacitated so they can veer away from unsustainable, harmful livelihoods towards safe, eco-friendly and sustainable initiatives for the benefit of the overall community.

But mining is a poor man's job. It is important that we provide our communities with tools to monitor mercury use and pollution using local and non-technical methods. Only when communities realize the damage and irreversible effects of mercury use and mining as a livelihood will they be able to strongly demand for alternatives from their LGUs. Sustainable livelihood options are available and can be explored in partnership with both government and non-government organizations.

FPE's conservation thrust does not favor mining. Its benefits, at best, are overshadowed by the myriad of negative effects it leaves in both the environment and communities working in the industry. Mining permanently alters the earth's surface, affects biodiversity, destroys critical habitats, kills species, contributes to the worsening impacts of climate change, causes pollution and poses risks to people's health and displaces them. Ultimately, Mining leaves behind a permanently damaged environment and poses high risks to communities' health and well-being.

FPE believes that investing in the protection and sustainable use of the country's rich resources to produce a continuous supply of ecological services is the most economically beneficial choice for the country in the long run.

Mining undermines biodiversity conservation investments and engenders unsustainable development. Mining threatens FPE's PhP334M+ of biodiversity conservation investments in over 24 critical conservation sites and PhP47M worth of investments to address pervading issues in mining from 2005 to 2015. Mercury use has been banned as well, given its irreversible negative effects to people and the environment.

We supported BAN Toxics in developing this community-based monitoring guide that will serve as a critical tool for communities and LGUs to ascertain whether mercury is still being used in their areas despite the ban and to make informed and speedy decisions relating to mercury pollution in their jurisdictions. The communities can also use this tool to lobby national governments and international bodies to improve existing policies on mining to safeguard the health of the people and the environment.

We look forward to more partnerships towards ensuring that our communities are provided with livelihood options that will not entail such dangerous and toxic undertakings. In the end, when communities are engaged in sustainable livelihood, their and their children's overall being are protected and the environment's ability to provide ecological services for the current and next generation is ensured.

**Godofredo T. Villapando, Jr.**

Executive Director  
Foundation for the Philippine Environment

# PREFACE

The success of any community intervention hinges on people's acceptance and awareness of the issue, and the ensuing actions they take in order to change the status quo. However, these two factors—people recognizing the problem and then doing something about it—do not happen automatically. Enhancing a community's knowledge and skills to help them carry out decisions and actions to initiate and sustain change in their communities is a complex task. This is a premise that BAN Toxics has been working on since scaling up efforts to mobilize artisanal and small-scale gold mining (ASGM) communities in five provinces across the Philippines where we have active projects, and forty other ASGM areas provinces which we hope to influence.

The process of empowerment does not happen overnight but the road to the sustainability of our interventions greatly depends on the building blocks that we put in: ownership and participation of the ASGM community.

Pollution from mercury, a highly toxic substance, is a very dangerous environmental and health problem that has not been prioritized by the Philippine government. While the country's Clean Air Act monitors mercury, focus is mainly on visible and common forms of air pollution. ASGM is the biggest source of toxic mercury emissions in the country. People who engage in ASGM are usually from the poorest communities, trying to make a living but driven to ASGM due to poverty and lack of other options. Largely unreached by government poverty reduction programs, they risk their lives by working with mercury because they don't know any other way to process ore. In ASGM mining sites women and children are particularly at risk.

This manual is the first among the series of learning tools that we at BAN Toxics have developed to facilitate a deeper analysis of the compounding issues and problems confronting ASGM communities. As a product of our ongoing community initiatives, the tools and exercises in this manual are derived from our experiences in organizing communities and conducting environmental justice campaigns. Although there are no straightforward formulas to mobilizing communities, BAN Toxics is very much inspired by a number of positive reviews from our local partners since pre-testing this guide.

Finally, we hope that this guide will help increase local stakeholders' capacity to monitor mercury use and pollution using local knowledge and initiatives. For BAN Toxics, this guide is a step towards enhancing the capacity of our ASGM partners to take ownership of their development aspirations and to take action initiate and sustain it.

**Richard Gutierrez, JD, LI.M.**  
Chief Executive Officer  
BAN Toxics

## ABOUT THIS HANDBOOK

This participatory research guide to monitoring mercury use and pollution is meant to help enhance the capacity of communities to monitor mercury use and pollution in their areas using local knowledge. The guide can help local communities gather information so that they can report it and act on it. Data gathered by communities will give local government units firsthand information about the situation in ASGM communities, the development aspirations of small scale miners and their families, and what government agencies can do to improve their lot. By helping equip local advocates and NGOs to monitor existing policies and lobby for policy improvement, BAN Toxics hopes that this guide will help empower local communities to protect their rights, safeguard their health and protect the environment.

# EXECUTIVE SUMMARY

Mercury pollution is a serious environment and public health problem that is frequently overlooked. Although it is supposed to be monitored under the Philippine Clean Air Act, focus has mostly been on visible and familiar forms of air pollution such as carbon monoxide, nitrogen and sulfur oxides and chlorofluorocarbons.

As an element, mercury occurs naturally in the environment and exists in a large number of forms. Primary mercury emissions may come from geological sources such as volcanoes and related geological activities, as well as land emissions from areas that are naturally enriched in mercury.

According to the United Nations Environment Programme (UNEP), all humans are exposed to some low levels of mercury. The severity of adverse health effects depends on factors such as the form of mercury, the dose and duration of exposure, the age of the person exposed and whether the person was exposed via inhalation, ingestion or dermal contact.<sup>1</sup>

Artisanal and small-scale gold mining (ASGM) is one of the most significant sources of mercury releases into the environment in the developing world. Mercury is used in small scale mining to process the ore through amalgamation. The mercury is burnt off in the final process—the gold is recovered as the mercury is vaporized. Mercury vapors then settle inside homes, in the soil and in bodies of water, exposing humans and wildlife to the poison.

Studies estimate that nearly 100% of all mercury used in ASGM is released into the environment. Current figures estimate that around 1,000 tons of mercury is released globally every year, accounting for 30% of total annual anthropogenic mercury emissions. Research suggests that this figure has been growing over the last decade along with the rise in prices of gold.<sup>2</sup>

ASGM is a complex development issue. While it provides a reliable source of livelihood among two million people in rural areas across the country, it is riddled with environmental, social and health concerns. In the Philippines, ASGM is the most significant contributor to the country's total annual mercury releases.<sup>3</sup>

A BAN Toxics study in 2010 examined ASGM in the Philippines, focusing on the trade and use of mercury, gold mining and production methods, as well as the human health and environmental impacts of mercury pollution. The study presented a gloomy picture of widespread mercury pollution. Unless urgent steps are carried out to contain further mercury discharges into the environment, the impacts are projected to be disastrous.<sup>4</sup>

Small-scale gold mining activities utilizing mercury has been recorded in a number of provinces throughout the country, notably in Benguet, Camarines Norte, Negros Occidental, Zamboanga del Norte, Zamboanga del Sur, Bukidnon, Agusan del Norte, Agusan del Sur, Surigao del Norte and Davao del Norte, Abra, Kalinga, Apayao, Oriental Mindoro, Compostela Valley, Isabela, Nueva Vizcaya, Quezon, Romblon, Southern Leyte and South Cotabato.

Community-based monitoring is a mechanism to engage communities in natural resource management to address environmental issues in ways that contribute to local sustainability. This process enables community members affected by a particular environmental condition to gather and report relevant information to the government and concerned organizations.

It enables concerned citizens, government agencies, industry, academe, community groups and local institutions to collaborate in monitoring, tracking and responding to environmental concerns.

This resource book is divided into two parts:

Part 1 describes the problem with mercury and outlines the health and environmental impacts of mercury use in ASGM. This section provides detailed discussions on the extent of the mercury problem and discusses the signs and symptoms of mercury poisoning.

Part 2 offers concrete action points to address the problem. This section explains the two monitoring approaches used by BAN Toxics to provide ASGM communities and local government units with strong and credible basis in presenting and tackling the problem more effectively. This part also recommends ways of setting-up a community-based monitoring system including guidelines to assess, gather information and monitor mercury use in an ASGM Community setting.

This section also gives an overview of how to develop a monitoring and campaign plan. It also outlines strategies for organizing community advocacy and campaign activities in parallel with community monitoring tasks.

This handbook is accompanied by a CD kit containing electronic copies of the various resources listed at the back of this publication.

# ACRONYMS

<b>ASGM</b>	Artisanal and small-scale gold mining
<b>CBM</b>	Community-based monitoring
<b>DENR</b>	Department of Environment and Natural Resources
<b>DOH</b>	Department of Health
<b>FPE</b>	Foundation for the Philippine Environment
<b>LGU</b>	Local Government Unit
<b>PSCOT</b>	Philippine Society of Clinical and Occupational Toxicologists
<b>UNIDO</b>	United Nations Industrial Development Organization
<b>USDOS</b>	US Department of State



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# PART I:

## THE PROBLEM WITH MERCURY

### Mercury, a persistent poison

Mercury or liquid metal, in Tagalog, *asoge*, is commonly found in the environment. It is that shiny silver metal inside old thermometers or old blood pressure monitors. It is very sensitive to fluctuations in temperature. At room temperature mercury slowly evaporates and it vaporizes completely when burned. Through the water cycle process of evaporation and condensation, mercury comes back to our environment and is converted from elemental mercury to organic mercury. It can travel long distances and is persistent. It is present in the air, water and soil.<sup>5</sup>

Mercury comes in several forms such as elemental or metallic and organic. People may be exposed to inorganic mercury through their occupations while people's exposure to organic mercury is through their diet.

Mercury occurs naturally in the environment. Primary mercury emissions may come from geological sources such as volcanoes and related geological activities, as well as land emissions from areas that are naturally enriched in mercury.

### Mercury in the environment

Source: <http://www.greenfacts.org/en/mercury/l-2/mercury-1.htm>

- a.) **Elemental mercury** is a heavy, silvery-white liquid metal that vaporizes readily at usual room temperatures. Most of the mercury encountered in the earth's atmosphere is elemental mercury vapor.
- b.) **Inorganic mercury compounds**, such as mercuric sulfide (HgS). These compounds are called mercury salts. Most inorganic mercury compounds are white powders or crystals, except for mercuric sulfide, which is red and turns black after exposure to light.
- c.) **Organic mercury** mercury is formed when elemental mercury combines with carbon. There is a potentially large number of organic mercury in the environment; the most common is methylmercury.

As cited by the Philippine Society of Clinical and Occupational Toxicologists (PSCOT), elemental mercury metal is commonly used in the small-scale mining of gold and silver, chlor-alkali production, manometers for measurement and control, thermometers, electrical switches, fluorescent lamps and dental amalgam fillings.

Mercury compounds are used in batteries, biocides in the paper industry, pharmaceuticals, paints, on seed grain and as laboratory reagents and industrial catalysts.

## Health impacts

According to WHO, exposure to mercury even in small amounts may cause serious health problems. This means that there are no safe levels for mercury. It may have toxic effects on the nervous, digestive and immune systems, and on lungs, kidneys and eyes.<sup>6</sup>

## Exposure to mercury

In this modern age, exposure to mercury may be inevitable. Mercury can be found almost everywhere—in fluorescent lamps, thermometers, pasta or dental amalgam fillings in our teeth, electronic switches and relays, pharmaceuticals, skin-lightening products and food that we eat. Communities with fish and shellfish in their main diet are exposed to organic mercury, also called methylmercury. Because of this everyday exposure, our body already has some level of mercury.

According to WHO, exposures to mercury can be acute or chronic and depending on the levels of exposure to different forms of mercury. These forms of mercury differ in their degree of toxicity and in their effects on the nervous, digestive and immune systems, and on lungs, kidneys, skin and eyes. It is a threat to the developing fetus, newborn babies and children in early life.

According to a number of studies, women and children are the most sensitive population in terms of toxic effects of mercury and irreversible impacts.

Approximately 80% of inhaled mercury vapors and 100% ingested organic mercury is absorbed by the human body.

## Who are at risk?

Source: *The Mercury Issue*. United Nations Environment Programme (2008).

All humans are exposed to some low levels of mercury. The factors that determine whether or not adverse health effects will occur and how severe the health effects include: the chemical form of mercury; the dose; the age or developmental stage of the person exposed (the fetus is the most susceptible); the duration of exposure; the route of exposure - inhalation, ingestion, dermal contact.

In particular, individuals and communities who are directly exposed to mercury through their occupation or local industry may be at risk.

There are a few general types of susceptible subpopulations in terms of methylmercury found in food; those who are more sensitive to the effects of mercury and those who are exposed to higher levels of mercury:

- The fetus, the newborn and young children are especially sensitive to mercury exposure because of the sensitivity of the developing nervous system. In addition to exposures during pregnancy, newborn babies can be further exposed by consuming contaminated breast milk. Thus, new mothers, pregnant women, and women who might become pregnant should be particularly aware of the potential harm of methylmercury.
- Individuals with diseases of the liver, kidneys, nerves and lungs are at higher risk of suffering from the toxic effects of mercury.
- Other subpopulations may be at greater risk to mercury toxicity because they are exposed to higher levels of methylmercury due to high fish and seafood consumption such as recreational anglers and subsistence fishers, as well as those cultures that tend to regularly eat fish and other seafood.

## What are the signs and symptoms of mercury poisoning?

Source: *The Mercury Issue*. United Nations Environment Programme (2008).

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- Individuals with diseases of the liver, kidneys, nerves and lungs are at higher risk of suffering from the toxic effects of mercury.
- Other subpopulations may be at greater risk to mercury toxicity because they are exposed to higher levels of methylmercury due to high fish and sea-food consumption such as recreational anglers and subsistence fishers, as well as those cultures that tend to regularly eat fish and other seafood.

The earliest effects of methylmercury poisoning in adults are non-specific symptoms such as paresthesia, malaise, and blurred vision. It can cause nausea, lack of appetite, weight loss, abdominal pain, diarrhea, skin burns and irritation, swollen gums and mouth sores, as well as drooling. With increased exposure, more severe symptoms appear such as numbness and tingling in the lips, mouth, tongue, hands and feet, tremors and lack of coordination, vision and hearing loss, memory loss, personality changes, respiratory distress and kidney failure.

Acute exposure to elemental mercury and vapor can result in acrodynia or "pink disease", which is characterized by bright pink peeling palms, fingers, and soles of the feet, excessive perspiration, itchiness, rashes, joint pain and weakness, elevated blood pressure and heart palpitations.

Methylmercury readily crosses the placenta from mother to baby, and also the blood-brain barrier. Methylmercury can also cause mental impairments and learning disabilities, cerebral palsy, seizures, spasticity, tremors, and lack of coordination, along with eye and hearing damage in the unborn baby as a result of the mother's exposure. In addition, methylmercury can also pass into the mother's breast milk, further exposing the newborn baby.

## Minamata disease

A well-documented study on the long-term effects of mercury can be gleaned from the experience of the people of Minamata in Japan. Between 1932 and 1956, a fertilizer plant released waste water containing methylmercury compounds into Minamata Bay. The methylmercury concentrated in the shellfish and fish, the main source of protein for many local people in the area. More than 200,000 people were affected. Little did people know that they have slowly been ingesting poison over a long period of time.<sup>7</sup>

Symptoms of Minamata disease include numbness in the hands and feet, muscle weakness, narrowing of the field vision and damage to hearing and speech. Acute cases include severe sensory disturbance, convulsions and even death.

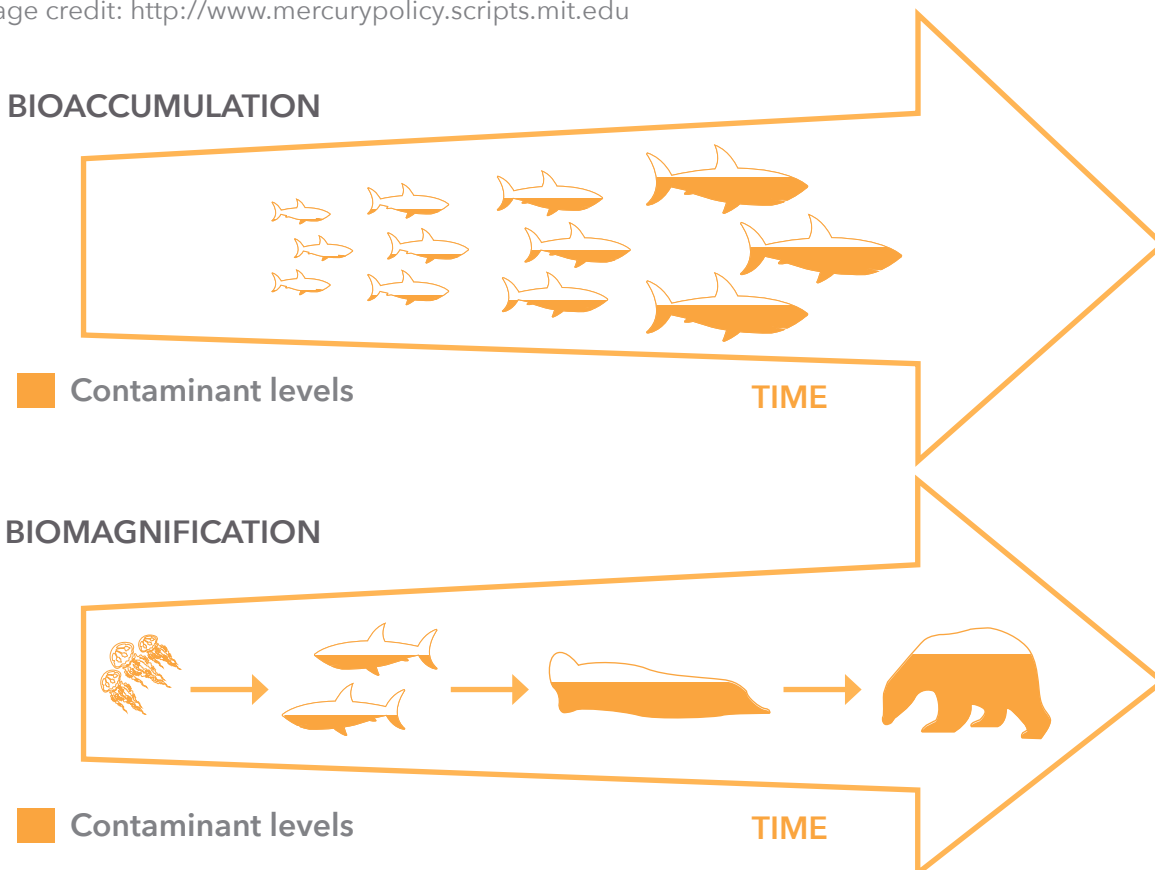
An example of the health impacts caused by elemental mercury vapor intoxication includes the mercury spill accident in a school in Paranaque City in 2006 during a sci-

ence laboratory class. According to the report, 50 grams of elemental mercury were spilled and 96 students were exposed and started to experience difficulty in breathing, chest pains, and fever. One student was diagnosed with mercury poisoning and suffered from Parkinsonism and nerve damage.

## Environmental impacts

Conversion of elemental mercury to divalent mercury (inorganic mercury) may lead to its deposition to land and water bodies through rain or precipitation. In aquatic systems such as lakes, rivers and seas, inorganic mercury is converted into organic mercury in the form of methylmercury. Methylmercury accumulates in the bodies of organisms that come in contact with it or ingest it where it increases in concentration (biomagnifies) as it moves through the aquatic food chain. Methylmercury is then bioaccumulated in the bodies of fish which will eventually be eaten by other animals and humans.

**Figure 1: Bioaccumulation and biomagnification**  
Image credit: <http://www.mercurypolicy.scripts.mit.edu>

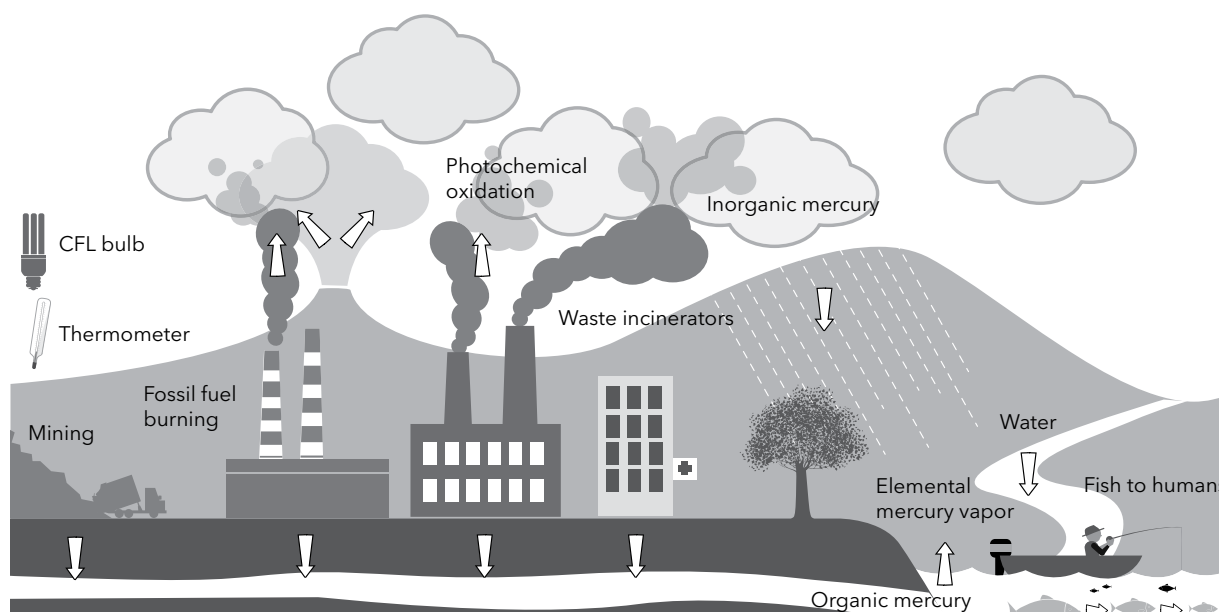


Consumption of mercury-contaminated fish and shellfish thus leads to mercury poisoning of people who are not directly exposed to mercury. Children and pregnant women are more susceptible to the effects of mercury. Also, pregnant women can pass mercury to their fetuses through the placental wall. For example, studies from

the Faeroe Islands in Denmark have demonstrated that the offspring of pregnant women exposed to even tiny doses of mercury (below the official threshold), resulted in children's reduced intelligence and difficulty in various learning processes as compared to the offspring of women not exposed to mercury.

**Figure 2: How mercury spreads through the environment**

Source: <http://www.deq.utah.gov/Pollutants/M/mercury/facts/atmospherictransport.htm>



**Table 1: Exposure to different forms of mercury and its effects**

Source: WHO Training Package for the Health Sector, [www.who.int/ceh](http://www.who.int/ceh)

MERCURY	SOURCES	ROUTES of EXPOSURE	ELIMINATION	TOXICITY
Elemental (metallic)	Volcanoes Combustion Waste incineration Thermometers Amalgams Folk remedies	Inhalation	Urine and feces	Central nervous system Kidney Lungs Skin (acrodynia in children)
Inorganic (mercuric chloride)	Lamps Photography Disinfectants Cosmetics Folk medicine	Ingestion Dermal	Urine	Central nervous system Kidney Gastro-intestinal tract Skin (acrodynia in children)
Organic (methyl; ethyl)	Fish Fungicides Preservatives	Ingestion Parenteral Transplacental	Feces	Central nervous system Cardiovascular

## Mercury use in ASGM

Artisanal and Small-Scale Gold Mining (ASGM) refers to mining activities that rely heavily on manual labor and use rudimentary methods to extract and process gold on a small scale. It is one of the most significant sources of mercury release into the environment in the developing world. According to UNEP, it accounts for about 12-15% of the world's annual gold production.<sup>8</sup>

The United Nations Industrial Development Organization (UNIDO) estimates that nearly 100% of all mercury used in ASGM is released into the environment. Such practices release at least 1,000 tons of mercury per year, and account for 30% of the total annual anthropogenic mercury emissions. These figures have been growing over the last decade along with the rising prices of gold.

The Philippines has rich gold deposits and ranks 19th in gold production.<sup>9</sup> Mercury use in ASGM in the Philippines started in the 1970s. It is estimated that around 350,000 miners including at least 18,000 women and children are directly engaged in this type of mining. Mercury emissions from the ASGM sector are estimated at around 250-400 tons per year.<sup>10</sup> This accounts for 80% of mercury releases in the environment in the Philippines, making the industry largest source of mercury emissions in the country.

At present, around 40 provinces in the country host small scale gold mining activities including Benguet, Camarines Norte, Negros Occidental, Zamboanga del Norte, Zamboanga del Sur, Bukidnon, Agusan del Norte, Agusan del Sur, Surigao del Norte and Davao del Norte, Abra, Kalinga, Apayao, Oriental Mindoro, Compostella Valley, Isabela, Nueva Vizcaya, Quezon, Romblon, Southern Leyte and South Cotabato.

## Amalgamation - a method of extracting gold using mercury

The most popular method of extracting gold by artisanal and small-scale gold miners in the Philippines is amalga-

mation or combining mercury with the ore to extract the gold. Miners who practice whole ore amalgamation feed mercury in the mills after the ores are reduced into fine particles. Some miners, on the other hand, first segregate the concentrates either by panning or gravity concentration. To hasten recovery of gold particles, a small amount of mercury is poured into the pan.

In the Philippines, whole ore amalgamation is very common. Miners add large amounts of mercury directly to the drums in the milling stations and use 10 to 25 grams of mercury to produce one gram of gold. The bulk of the mercury is, however, lost in the milling process and is left as metallic waste in the fine sands of the tailing ponds of the milling stations.

A 2001 report submitted to the UNEP by the Department of Health estimated that small-scale gold mining in Northern Mindanao alone emits 140 tons of mercury annually. Since 1986, various studies have been conducted to estimate mercury releases from small scale mining in the Philippines. However, due to scarcity of data on small-scale mining activities in the country, the figures shown are not a representative of the total releases.

The variations in the data reveal the lack of adequate research and monitoring on the use of mercury in ASGM. Monitoring of mercury use is essential in order to obtain accurate figures on mercury releases and the extent of mercury pollution in the country.

These reports indicate that the extent of mercury use in ASGM in many areas of the Philippines is a disaster waiting to happen, the magnitude of which can be far greater than the incident in Minamata, Japan where an estimated 80 to 150 tons of mercury were dumped from 1932 to 1968<sup>11</sup>. Since ASGM is a poverty-driven activity, the desire of miners to immediately produce income to sustain basic needs on a day to day basis has been identified as the main reason why mercury use has become widespread in the sector.<sup>12</sup>

**Table 2: Mercury releases in the Philippines, according to different studies**

YEAR	Mercury releases in the Philippines, according to different studies
2008	70 tons (Philippine Government estimate)
2007	5 tons from four small small-scale mining communities in Zamboanga del Norte and Camarines Norte (Appel, Perez, Køster-Rasmussen).
2001	140 tons from two large small-scale gold mining communities in Northern Mindanao (DOH assessment submitted to UNEP)
1986-1988	A total of 140 tons in 3 years from 53 mining communities (Appleton et al., 1999)



**Figure 3:** Amalgamation: combining mercury and ore to extract gold in small-scale mining.

The diagram below illustrates the process of extracting gold from ore using mercury.

Photos: BAN Toxics. Please see accompanying CD for photographs of the entire process outlined in this figure.



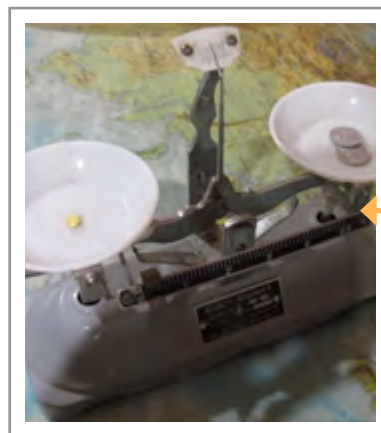
EXTRACTION



CRUSHING



GRINDING

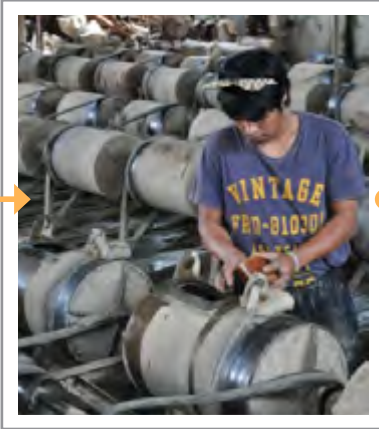


GOLD THE END PRODUCT



AMALGAM BURNING





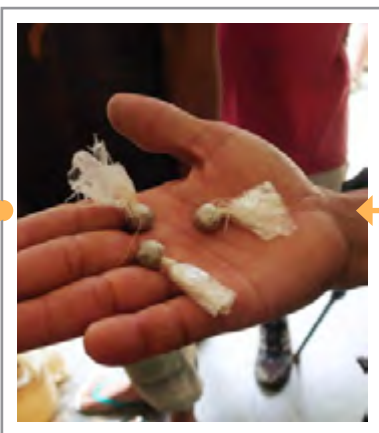
MERCURY MIX  
(WHOLE ORE AMALGAMATION)



SLUICING



RECOVERY OF  
SLURRY LADEN  
WITH  
MERCURY



SQUEEZED AMALGAM



SQUEEZING

## Types of ASGM activities in the Philippines

There are several forms of ASGM activities in the Philippines: surface, underground and underwater.

Surface mining involves searching for and washing auriferous (gold-bearing) gravel along riverbeds and streams. Underground mining, the most common method of ore extraction, requires digging tunnels to extract gold-bearing ore. Underwater mining, which is widespread in Camarines Norte province in southern Luzon, involves the extraction of gold-bearing ores in muddy rice fields and underneath the sea or river. Suction mining involves the use of a boat equipped with a machine, compressor, suction hose, sluice box and other dredging devices. The miner dives underwater breathing through a suction hose to catch auriferous gravel and sand believed to be washed away from the mountains on its way to the rivers and seas. In underground mining, before the ore is processed, the miners sample the water with a small pan to determine the presence of gold. Once convinced that the amount of gold that can be extracted is economically profitable, they continue digging ore and bring them to the mills or plants for processing.

Ore brought to the mills are first crushed either manually with sledgehammers or with the use of mechanical crushers. Once crushed, the ore is further refined in the mills (ball mills or rod mills). To extract the gold, miners either employ sluicing and gravity concentration, amalgamation or cyanidation.

Sluicing combined with gravity concentration and direct smelting has been the traditional gold production technique employed by small-scale gold miners in the Philippines prior to the introduction of mercury amalgamation and cyanidation. Sluicing uses gravitation by letting the ore pass through a sluice, made of wood or concrete and a launder which is covered with jute, carpet or corduroy cloth. The cloth is subsequently washed in a basin to recover the gold and other particles collected, which afterwards are panned to separate the gold.

Leaching or cyanidation where cyanide solution is used to dissolve the gold from the host rock, typically involves four main steps: (1) crushing and grinding of gold ores into fine materials; (2) treating the fine ores with cyanide solution; (3) harvesting of the gold-bearing solution; and (4) gold recovery or removing gold from the solution with activated carbon or zinc dust.

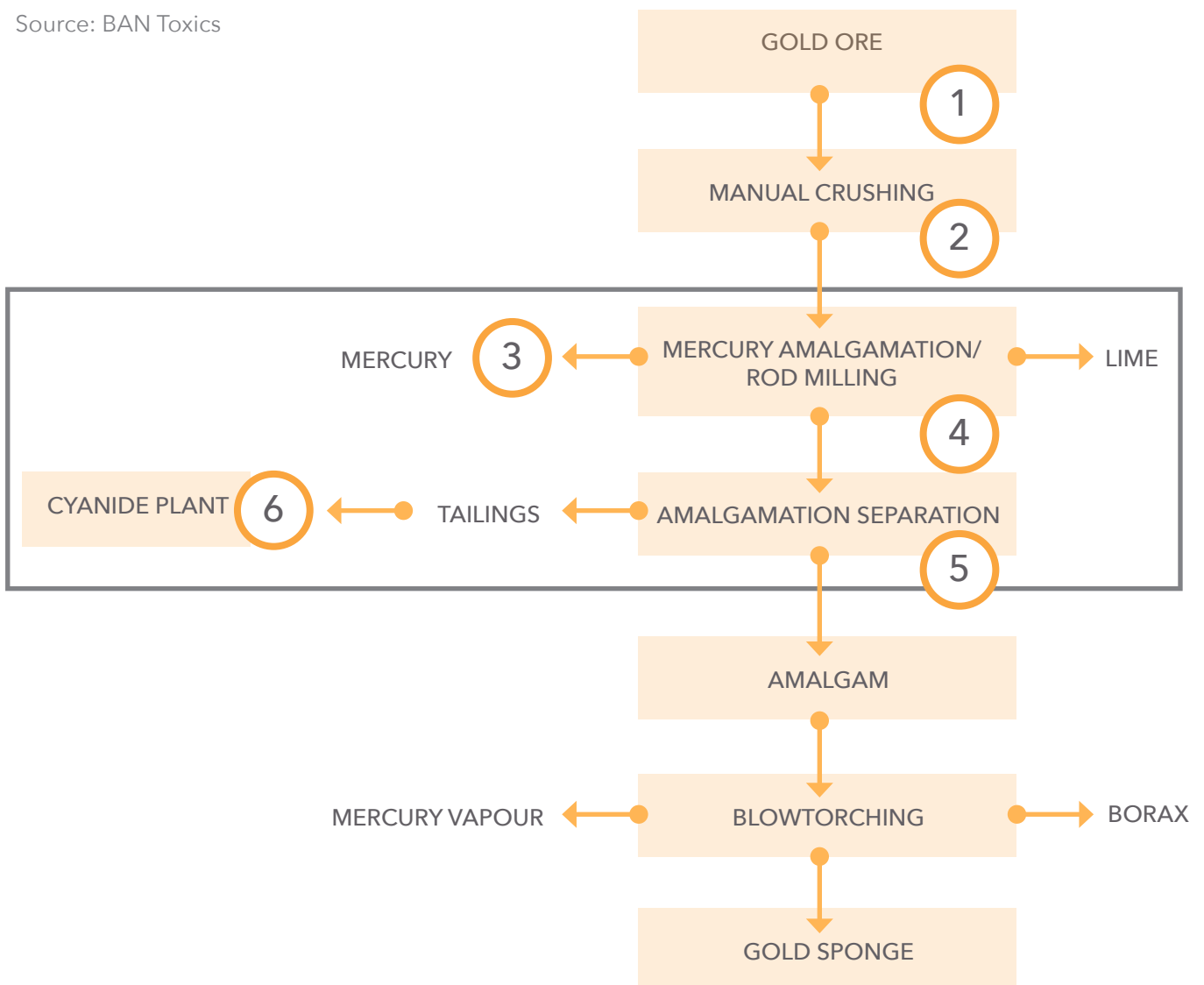
Cyanidation in the Philippines takes three forms: carbon-in-leach, carbon-in pulp and heap leaching. The fastest and most commonly used among the three is carbon-in-pulp. This technique allows gold recovery within 72 hours by strongly agitating the mixed concentrates. In the province of Benguet in northern Philippines, however, heap leaching and carbon-in-leach are the most popular methods used.

Almost all mercury used in ASGM is released in the environment. Mercury, once released, persists in the environment. It circulates in the ecosphere and is absorbed by various organisms, impacting biodiversity and poisoning rivers and fish.

**Figure 4: Mercury amalgamation flowchart.**

This flowchart shows the step by step process of extracting gold using mercury. In some areas such as Camarines Norte, lime (*calamansi*) is used during the process.

Source: BAN Toxics



## Mercury pollution in ASGM

The major pathway of concern for the miner is through the inhalation of mercury vapor from burning mercury amalgam. Some mercury is also absorbed directly through the skin when amalgamation is done by hand. Typically, amalgamation and burning are done with no protective measures (such as retorts or gloves) and often in the presence of children or even in the home.

### In small scale mining people are exposed to mercury in various ways

Source: Mercury use in Artisanal and Small-scale Mining, UNEP

Mercury vapor settles in homes, onto food preparation areas, soil and into local bodies of water. Mercury vapor can be carried long distances in the atmosphere, deposited in water and is eventually taken up in bacteria in aquatic environments. It bioaccumulates in the food chain and is the primary source of mercury in our food. Even in low doses, methylmercury poisoning causes neurological problems and is especially dangerous for women of childbearing age. With extremely high mercury concentrations found in breast-milk of nursing mothers in ASGM communities, infants are especially at risk.

Mercury dust is also carried on the clothing of miners and brought back to their homes.

Health surveys across ASGM sites worldwide show high levels of mercury in miners. Some miners are being exposed to levels of mercury that exceed more than 50 times the World Health Organization (WHO) public exposure limit.

### Why should we be concerned?

Source: Mercury use in Artisanal and Small-scale Mining, UNEP

Sites contaminated with high concentrations of mercury, usually in or near flowing water, are major sources of mercury dispersion into aquatic systems, resulting in methylmercury contamination of fish and wildlife and impacting the lives of thousands of people involved with, or living in general proximity to, mining activities.

Typically mercury-containing tailings are dumped into or beside bodies of water and as a result soil, rivers, streams, ponds and lakes are contaminated for very long periods of time. There are thousands of polluted sites that will be affected for decades to come, and their impacts extend beyond the local area, often presenting serious, long-term environmental health hazards to populations living downstream of mining regions. One particular danger comes with the disintegration of tailing dams due to floods or severe weather. This results in high quantities of mercury-laden sediments being washed downstream. A related danger comes from the combined use of mercury with cyanidation, a very hazardous combination as it promotes the methylation of mercury.

### What can you do to prevent and eliminate mercury pollution in ASGM?

You can start with understanding and mapping where mercury comes from in your community, the extent of pollution and how this is creating a negative impact on you, the people around you and the community you live in.

Monitoring and addressing the mercury problem in your community is key!

## Mercury monitoring approaches

Monitoring is the process of taking regular measurements of something using indicators in order to provide a better understanding of the current situation and projected trends<sup>13</sup>. In monitoring mercury use in ASGM, two approaches can be used, the technical and non-technical.

### Technical approach through the Lumex RA 915+ mercury analyzer

The technical approach requires the use of specialized equipment. The Lumex RA 915+ mercury analyzer is a multifunctional atomic absorption spectrometer used to measure mercury vapor in different areas to establish data on mercury use and release to the environment. It operates using the principles of atomic absorption spectrometry, an analytical technique commonly used for the quantitative and qualitative determination of elements from a wide variety of samples. It is used by most research laboratories and industries around the world. The same equipment is used by the United States Environmental Protection Agency (US EPA) to monitor mercury during cases of emergency spills.

For better understanding of the equipment and its use, you may refer to the *Lumex RA915+ Mercury Analyzer Operations Manual*.

But using Lumex alone to monitor mercury use is rather limited because it can only detect presence of mercury in the air. A separate equipment and process needs to be conducted to detect the presence of mercury in fish, sediments and water.

Substantive capital is needed to purchase Lumex equipment. Also, most local communities in rural areas do not have enough resources, technical know-how and means to fund such activities using technical equipment and laboratory analysis.

### Non-technical approach through community-based monitoring (CBM)

Most ASGM communities are located in poor, far-flung municipalities in the Philippines. The limited number of mercury analyzer units in the Philippines underscores the need to pass on non-technical capabilities and practical knowledge to LGUs and communities to enable them to make informed and speedy decisions related to mercury pollution in their jurisdictions.

Community-based monitoring is a mechanism to engage communities in natural resource management to address environmental issues in ways that contribute to local sustainability. Ecological community-based monitoring enables community members affected by a particular environmental condition or resource depletion to gather and provide feedback on relevant information to government agencies or organizational bodies. It equips concerned citizens, government agencies, industry, academe, community groups and local institutions to collaborate in monitoring, tracking and responding to environmental issues.

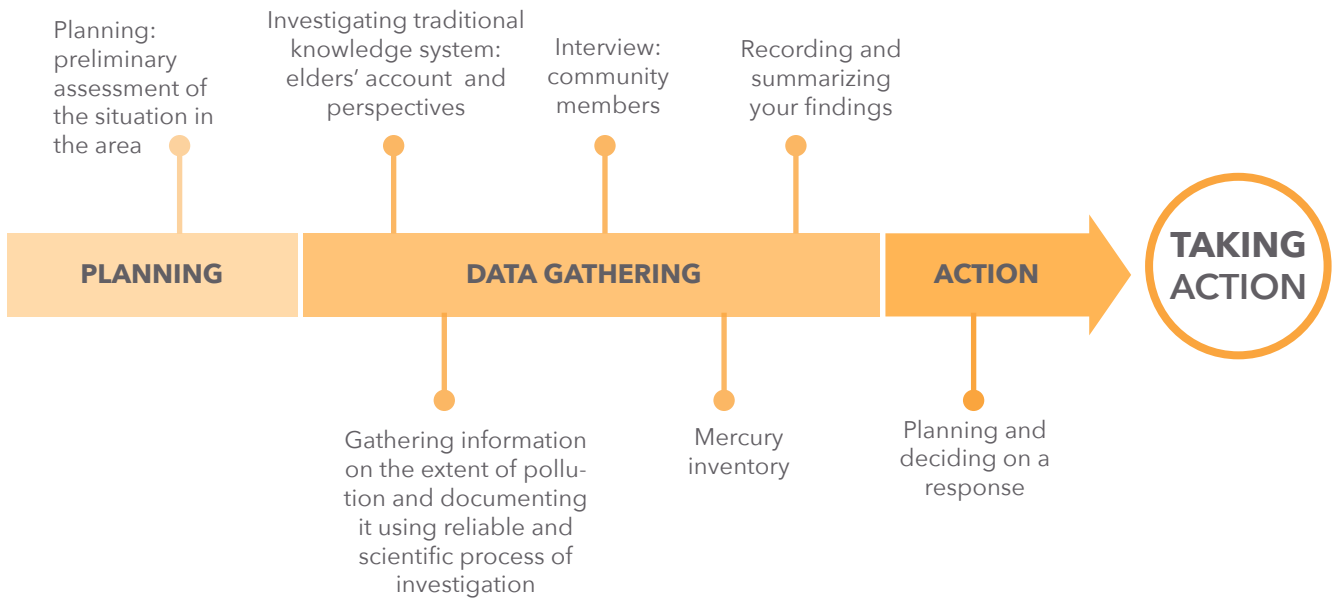
In the absence of a machine like the Lumex RA915+, the Community Action Guide is an alternative tool to determine whether mercury pollution is present in the community. The guide is intended for LGUs and ASGM community stakeholders to show them other techniques and tools to use in monitoring and evaluating signs of mercury pollution that can be used in a small-scale mining facility and surrounding communities.

The community action guide is a tool that can be used to gather relevant information on mercury use in mining communities. It is a "living" guide that will allow the community stakeholders to manage and implement a monitoring program on an ongoing basis and to tailor it in accordance with the specific needs and capacity of the community at a given time.

## PART 2:

# WHAT CAN YOU DO TO ADDRESS THE PROBLEM?

**Figure 5:** Steps in setting up and implementing your community-based monitoring system



## PLANNING

Planning is the first step in developing a monitoring activity. It is where key decisions are made. The presence of the different stakeholders is very important in order to provide all parties an opportunity to increase their un-

derstanding of the issue. This will ensure all parties will be able to contribute to the process and direction of the monitoring activity. This will also provide stakeholders a sense of ownership—one of the important factors towards improved decision making.

**Figure 6:** Steps in setting up and implementing your community-based monitoring system



Conducting a preliminary assessment of the area is important to provide basis for the development of the monitoring plan. This can be as simple as secondary research or paying a visit to your local village hall and ask for a copy of your Barangay Development Plan. As you do your research, take note of the following details: general conditions of the area, physical characteristics of the project areas and previous research studies which can be easily analyzed before the actual field trip. (Please refer to the Annex - General information about the ASGM community).

Some relevant information may be found on the web pages of the local government units in the area where you are undertaking the monitoring.

## DEVELOPING SITE INDICATORS

Indicators are the most important components in monitoring mercury use. Indicators determine the factors to be focused on by the monitoring. The first set of indicators makes use of various knowledge systems<sup>14</sup> as the determinants of mercury use in ASGM communities. The second set of indicators makes use of comparative information that allows you to see which practices deviate from the requisites of the mercury-free gravity concentration method (See Annex B).

### Knowledge systems

#### A. Traditional knowledge indicators

These are indicators or information that usually comes from the perspective of elders. These can be questions that start with how and when mercury use in gold ore processing started in the community. It is also relevant to trace how mercury entered the community. These indicators can give you an idea of the people's culture and behavior related to mining activities.

#### B. Science-based indicators

These are indicators identified through scientific process and analysis.

#### C. Community-based indicators

These are indicators gleaned through everyday experiences. This information can be gathered from interviews with small-scale miners themselves, children, health workers and community leaders. This data will show the current trends of mercury use in the community as the people narrate their day to day experiences.

## DATA GATHERING APPROACHES IN COMMUNITY-BASED MONITORING

Community-based monitoring should be simple and economically feasible. Simple tools are used, including community surveys, focus group discussions, key informant interviews, field observations, site surveys, etc. When conducting data collection, you should select stakeholders who represent various interests of the community and, if possible, groups or individuals who are objective about the issue.

Questionnaires and interviews are the most useful techniques in getting detailed information about people's opinion on mercury use in the community. Questions for the interviews may be structured or open ended and should be kept direct, simple and easy to understand by the respondents. The questions should generate important information about mercury use in the mining area.

A simple observation of what is visible in the mining communities is a quick and easy way to get information on the situation. However, to be able to get credible and substantial information, the person observing should be aware of what needs to be observed. It is useful to take note of the different behaviors of the people in the community. Photo documentation will document what has been observed in the community.

## ETHICAL CONSIDERATIONS

In conducting your community monitoring research, key ethical principles should be taken into account. These principles stress the basic obligation to do good and do no harm.

This means that as a researcher, you need to obtain informed consent from potential research participants, minimize the risk of harm to participants, protect their anonymity and confidentiality, avoid using deceptive practices, and give participants the right to say no.

Before conducting your activities, make sure that your participants understand the purpose and the benefits of their cooperation. It is important to be transparent about how the information will be used by advocates to help improve ASGM practices and to call on local government units, international bodies, civil society groups and local communities to take action.



## ACTIVITY GUIDES: community-based monitoring tools

The following activities serve as a guide to implementing your monitoring activity effectively. Depending on the number of members, relevance and timing, you can set aside a day or time to do the recommended activities. Make sure that you keep notes of the results. We have included some samples of forms and templates in the last section of this report to help you organize and record your observations and findings from the field.

The following research tools aim to gather relevant information on key monitoring components:

1. Conditions of use – the information gathered will give a ‘snapshot’ of mercury use in your community and the risk factors that may lead to acute and chronic exposure or poisoning.
2. Community health impacts – the information gathered will provide a clear link between use of mercury and exposure, and will also determine whether health problems are due to other causes and, thus, mercury exposure can be ruled out.
3. Incidence of acute poisoning – the information gathered will record and build solid evidence on the direct effect of continued mercury use on people’s health and to ensure that proper reporting by the locals occurs more effectively.

### Activity 1: Do a simple research on the time the community started using mercury and the factors that encouraged them to use it

**At the end of the activity, the team would have:**

1. Gathered and validated historical accounts on the entry of mercury in the mining community;
2. Documented the historical, social, economic and political context of the mining industry vis-à-vis mercury use in the mining community; and
3. Documented the perception of elders on the health and environmental effects of mercury (based on basic knowledge and personal experience).

#### Methods:

Request at least three elders to tell a story about ASGM in their community, as well as their personal opinions about the industry. The interviewees can be a friend’s grandfather/grandmother or a former community leader. Alternatively, you can ask them to draw their story. At the end of your interview, you can show a video about the hazards of mercury use in ASGM to increase their awareness on the issue.

Assign another member of the team to document the discussion. Take photos.

#### Materials:

1. Crayons and markers
2. Manila paper
3. Ballpens
4. Notebook for facilitator
5. ASGM Video

#### Guide questions:

These questions will help you draw some more stories and anecdotes from the locals as you continue asking about the topic.

When did ASGM activities start in the community?	This is important to identify how long ASGM has been operational in the area (i.e., how many years), and will help in assessing how extensive the health and environmental effects could have been.
Who taught the people to mine?	Knowing the origin of technology used in the area can help the team initially identify if the methodology introduced to them involves the use of mercury (i.e., if it is a technology other than the gravity concentration method).
What was the gold recovery technique used by the people back then? Did they use mercury?	This is to clarify what method was used or had been used (in case another technology was introduced), and specifically validate if the miners used mercury in gold recovery.



Why do you think mercury became acceptable to the people? What do you think mercury is made of?	It is helpful to understand the behavioral context of the people's perception of mercury use, i.e., the perception of older miners may have influenced that of the current generation of miners.
Where do you get or buy mercury? How much per grams/kilo?	To give us an idea about supply and trading system.
Did you see any negative effects of mercury on the environment or people's health?	Information if negative effects of mercury, e.g., human poisoning or sickness, had been reported in the past can be gathered from elders. If the answer is positive, the interviewer could go back to the previous question to let the elders expound more.

## Activity 2: Healthy brains, bright minds Children's knowledge and perception about mercury use and its impacts

A number of researches show that constant exposure to mercury even at low levels has serious physical effects on children and young adults whose bodies are still developing.

An effective awareness raising campaign involves youth and children. This activity will help you gather their perception about mercury toxicity and its impact. This will also help you do the math—how many of them in your community know about the hazards of continued use of mercury? Is there any reported incidence of acute mercury poisoning at home and in schools

### At the end of the activity, the team would have:

1. Validated information on mercury use from the perception of school children and youth;
2. Documented the perception of children and youth on the health and environmental effects of mercury (based on acquired knowledge in school and personal experience).

### Process:

Request at least five pupils/students (12 to 17 years old) to tell a story about the involvement of their families in ASGM, as well as their personal opinions about the sector. The interviewees should be children of miners. (Note: Inform the parents and/or teachers of the children that you intend to conduct an interview with the minors. Alternatively, you can ask the participants to illustrate their responses through drawing or other creative means. Before closing the activity, the facilitator may read a story. (You can use BAN Toxics' storybook for children, *Ang Gintong Talakitok*).

Assign another member of the team to document the discussion. Take photos.

### Materials:

1. Colored pens, Crayons and A4 sheets
2. Checklist of common signs and symptoms of mercury poisoning
3. BAN Toxic's storybooks for children
4. Notebook for facilitators

### Guide questions:

1. What is your family's source of income? Do your parents participate in small-scale gold mining in your community? If yes, what and where do they mine? Since when?	This will provide a backgrounder on the interviewee's family and their sources of income (which is mining). This is a good transition to the next questions. Note that the question about their parents' participation in mining was not immediately asked.
2. What materials / chemicals do they use in gold mining? Where do they get it? How do they use it? Can you describe the process?	
3. Do you participate in the mining activities? What specific step or steps in the mining process do you participate in?	

<p>4. Do you smelt gold at home?</p> <p>5. What kind of substance is being added to extract the gold?</p>	
<p>6. Do you think materials or chemical (mercury) can have negative effects to the environment and people's health? How?</p>	<p>The facilitator can use BAN Toxics story books to illustrate the impacts of mercury pollution in the community and solicit responses.</p>
<p>7. Is there metallic mercury in your school?</p> <p>8. Has mercury been spilled at school?</p> <p>9. Has a mercury spill been vacuumed?</p>	
<p>10. Do you keep mercury at home?</p> <p>11. How many grams/kilos? 1 bottle?</p> <p>12. Where do you store it?</p> <p>13. Do you play with it? What about your siblings?</p>	
<p>14. Do you know anyone (family or neighbor) who has been poisoned by mercury/became sick because of this chemical (mercury)?</p>	<p>The facilitator can use a checklist of signs and symptoms of mercury poisoning when doing this part of the investigation.</p>

### Activity 3: Knowledge and perception of women miners on mercury toxicity and its impacts on health and environment

Women in ASGM communities perform major roles and contribute significantly to the development of the sector. But for the most part, the contribution and role of these women are not recognized. For instance, in some areas women are considered "bad luck" and are not allowed to enter the mine tunnels. They are often seen as weak and are relegated to simple tasks such as guarding the mercury-gold amalgam while it is being processed, which increases their exposure to mercury.

Women, however, play a critical role in the mining community. Women are the primary caregivers for the children and are responsible for their health and well-being. They are also responsible for running the household and they play a crucial role in maintaining the family expenses.

It is useful to understand the gender dimensions in ASGM to obtain a better picture of the workings in a community. This exercise will help us gather important information about mercury use and toxicity from the perspective of women.

#### At the end of the activity, the team would have:

1. Gathered and validated information on mercury use based on knowledge and perception of women miners;
2. Documented the historical, social, economic and political context of the mining industry vis-à-vis mercury use in the mining community; and
3. Documented the perception of women on the health and environmental effects of mercury based on their community mining activities and personal experiences

#### Process:

Gather at least 10 women who are involved in mining in their community. Ask them to tell a story about their involvement in ASGM, as well as their personal opinions about the activity. Women can share their views about mercury, its effects (good or bad), its economic gain (low or high) and the involvement of the family in sustaining family's income. Alternatively, ask the participants to draw their story. At the end of the interview you may show them a video about the impacts of mercury use to health and environment.

Ask another member of the team to document the responses. Take photos.

**Materials:**

1. Colored pens, crayons and A4 bond papers
2. Checklist of common signs and symptoms of mercury poisoning
3. Template for mercury use (volume per day/week/month, process and methods)
4. ASGM Video

**Guide questions:**

<p>1. What is your family's source of income? Do you participate in small-scale gold mining in your community? If yes, what and where do they mine? Since when?</p>		<p>6. Do you keep mercury at home? 7. How much mercury do you keep at home? 8. Where do you keep it?</p>	
<p>2. How do you participate in the mining activities? What specific step or steps in the mining process do you participate in?</p>		<p>9. Do you think this chemical (mercury) can have negative effects to the environment and people's health? How?</p>	
<p>3. What chemicals do you use in gold mining? Where do you get it? How much does it cost per kilo? How do you use it? Can you describe the process? If it is mercury, can you give an estimate of mercury volume used in a week/month by your family?</p>	<p>Please use separate template to record your findings on local sources/supply of mercury, cost of mercury and volume of mercury use in gold recovery per week/month.</p>	<p>10. Do you know anyone who has been poisoned by/became sick because of this chemical (mercury)?</p>	<p>The facilitator can use the health assessment form in the Annex for added information about health history.</p>
<p>4. Do you burn amalgam at home? 5. Where do you store the amalgam smelting equipment after use?</p>		<p>11. Aside from mining, do you have any other alternative source of income that helps your family? If yes, what it is?</p>	
		<p>12. Do you participate in any women association's activities in your community? If yes, what type of activities?</p>	

**Activity 4: Check with your local health providers and get statistics on mercury poisoning incidents and how such cases are managed**

Local hospitals and clinics are your best sources of information. Ask your local doctors and health care workers about this issue and see how much they know about it. Whatever information you will gather will help in developing an effective monitoring system in your community. Remember, this is more than knowing the extent of mercury pollution in your community. It is also about taking action.

**At the end of the activity, the team would have:**

1. Documented cases of and updated reports on acute mercury poisoning in the local area;
2. Obtained information about how local health care providers manage mercury poisoning, how much they know about the issue, and the things they need to manage it better; and
3. Shared and discussed ways of monitoring and managing mercury poisoning in the community.

**Process:**

Visit a nearby health centre and ask for their three-year record of morbidity and mortality in the community. The health records may indicate illnesses that can be linked to mercury symptoms as stated in Part 1.

**Materials:**

1. Camera - take a photo of the medical records, if available
2. Notebook and pencil

**You may want to probe further by asking the following questions:**

1. What are the common illnesses of the people in the community?	
2. Have you seen pregnant women and/or children living near the mining area? What are your observations about them?	
3. Do you know any symptoms of mercury poisoning? If yes, have you found someone in the community who has these symptoms?	
4. Have you been trained to detect, diagnose and treat symptoms of mercury poisoning?	
5. Where do you think miners get their mercury? Is it sold in the local market?	

**Activity 5: Observe and investigate, visiting ball mill stations in your neighborhood**

You can also gather information by observing ASGM activities in your community. For example, you can go to a ball mill and observe their methods of recovering gold. Take note of the type of equipment and implements they use to do it.

**At the end of the activity, the team would have:**

1. Gathered and validated information on mercury use by miners and ball mill operators as to the amount of mercury purchases over last year and current year;
2. Documented the historical, social, economic and political context of the mining industry vis-à-vis mercury use in the mining community; and
3. Documented the perception of miners on the health and environmental effects of mercury based on their community mining activities and personal experiences.

**Process:**

Visit a small-scale mining facility. Identify and describe what are the other equipment, machines and materials used by small-scale miners in their respective mining facilities that is/are not listed in the Gravity Concentration Method table.

Gather some miners and ask them to tell a story about their involvement in ASGM, their personal opinions about the industry and the methods they use to extract gold. Miners can share their views about mercury, its effects (good or bad), economic benefits they gain from its use and the involvement of the family in sustaining household income.

**Suggested Techniques**

**A. Interview**

**Guide questions:**

What method do you use to extract gold?	
What chemicals do you use in gold mining? Where do you get it? How much does it cost? How do you use it? Can you describe the process? If it is mercury, can you give an estimate of mercury volume used in a month by your family?	Use template to record your findings: Local sources/supply of mercury; current market price per kilo; methods of use; and volume of usage per week/month.

Do you think this chemical (mercury) can have negative effects to the environment and people's health? How?	
Do you know anyone who has been poisoned by/became sick because of this chemical (mercury)?	Use the checklist of the common signs and symptoms of mercury poisoning provided in the Annex.
Do you know an alternative method in extracting gold without the use of mercury? If yes, what is it? Can you describe the process?	
Aside from mining, what other alternative income generating activities does your family have? If yes, please describe.	

## B. Covert observation and using indicators




Observations are commonly used in research surveys. If properly conducted, this can generate information that supplements the data that you have gathered through interviews and participatory research processes. As you do this, try to act as low key as you can. If you are not from the community you are observing make sure that you blend well with the crowd and with the conditions in the community. For example, wearing sunglasses and using expensive-looking cameras and other gadgets will probably not help you do this task successfully.

### Process:

BAN Toxics developed a list of site indicators based on several visits to small-scale mining areas. You may have come across with these materials in mining facilities in your community. Follow the table provided in documenting the information.

### Materials:

1. Notebook and pen
2. Small camera

Location of the mining facility	MATERIALS AND EQUIPMENT	DESCRIPTION
Magdiwang, Romblon	1. Use of umbrella cloth 	Umbrella cloth is used by small-scale miners for whole ore amalgamation. After the mercury is believed to have captured the gold, the mercury-ore mix is placed on a large basin, and then transferred to a washing pan where water is added to retrieve the mercury that is loaded with gold. Lastly, the mixture is squeezed with a fine umbrella cloth.
Jose Panganiban, Camarines Norte	2. Basic fume hood used when for burning concentrates. 	The amalgam is burned using a burner with a basic fume hood. The heat vaporizes, leaving behind the gold.  Be aware of the smell of burning metal. It's a sign of a recent smelting activity.
Balatoc, Pasil	2. Elemental mercury 	The amalgam is burned using a burner with a basic fume hood. The heat vaporizes, leaving behind the gold.  Be aware of the smell of burning metal. It's a sign of a recent smelting activity.

Location of the mining facility	MATERIALS AND EQUIPMENT	DESCRIPTION
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Magdiwang, Romblon

4. Use of Wooden pan

A wooden pan is used to separate gold concentrate from ore concentrate. According to Leoncio Naoy, a miner from Benguet, miners prefer using wooden pans because they are naturally buoyant, making it easier to hold in the water. However, Benguet miners recommend the use of a metal/steel pan because it is easier to rotate and is smaller and lighter (without mercury) than the usual wooden pan.

Disclaimer: This indicator may only be used to detect mercury use in Romblon and not in other ASGM areas.

5. Are metal/steel pans being used? These pans are critical for concentrating gold. The technique of panning is an effective gravity concentration method. Done properly and efficiently, it can help miners skip mercury use.

1. Ask to see the metal/steel pan. The location of the metal/steel pan is an immediate indicator about the methods used. Usually miners who are actively using metal pans would place these close to the area of work. If the pans are far from their work areas, this means that the pans are seldom used, in which case the miners are probably using mercury.

2. Inspect the metal/steel pan. Miners actively engaged in gravity concentration method can wear out the pan in 1 to 2 months. Pans that are not worn out or have little signs of wear can be an indicator of mercury use.

6. Look at the shape of the sluice boxes. Are they short? Do the miners have means of controlling water flow in the sluice box?

Short sluice boxes indicate that a miner is using mercury as there is little concern over effective gravity concentration.

The same applies if the sluice box does not conform to a shape or have any structure to control water flow. Miners who use mercury are not concerned about effective sluicing and would not pay attention to controlling water flow in the sluice.

7. How much water does the operation use while sluicing?

Gravity concentration depends on good water supply and flow. Miners who do not pay attention to their water supply are most likely using mercury.

Location of the mining facility	MATERIALS AND EQUIPMENT	DESCRIPTION
	8. Look at panning techniques. How often do they pan?	Panning is an important part of effective gold concentration. Miners that use mercury are not efficient and skilled panners as they rely on mercury more than their panning skills to collect the gold.
	9. Look at other practices of recovering gold to determine whether miners are using mercury or not.	Detergent soap and magnets are usually used for methods that do not require mercury.  A stock of local lime fruits (calamansi) and ice cubes indicates mercury use.

### C. Mercury in the environment - Anecdotal evidence

Mercury circulates in the environment. When exposed, it evaporates at room temperature and the rate of evaporation increases as temperatures rise. Once mercury vaporizes it stays in the atmosphere until it is deposited on soil or water by rain. Mercury can then be found in plants, sediments and water bodies.

As you go around the neighborhood, try to listen to people's stories and carefully include them in your list of indicators. And keep in mind that the more people talk about the same story, the greater the chances of this being representative of the reality, and the higher the chances of this being true.

You may try to investigate if the stories are true in your own community. Remember to use proper precautions and protective measures when doing this activity, particularly when handling and storing elemental mercury. *Please see the Annex for some tips on the proper handling of mercury and mercury containing equipment/products.*

Look for instances like these and cite them:

#### ANECDOTES

In Romblon Province people talked about the difference between cows in areas where mercury is used and areas where it is not. In areas where mercury is used, they say cows are thin because of the lack of vegetation. In areas where mercury is not being used, they say cows are healthier because the grass is greener and more abundant.

In Mt. Diwata, Compostela Valley, people can tell if the water has mercury through the formation of metallic and silvery dots on the surface of taro leaves after the plants are watered.

In Gaang, Kalinga Province, miners recover mercury from their tin roof by scrubbing it over with ice cubes and a sponge.



## Recording and summarizing your findings

In this phase, data collected in the field are transformed into credible evidence that mercury use in small-scale mining activity still flourishes in the community. Building and designing your own database is a good way to start classifying your quantitative data. You can assign this to a member of the team who knows how to use a database application such as Microsoft Excel.

Don't sweat it out: if you don't have a computer, just list down common questions and answers on a manila paper, have your team go through answers one by one as you write it down.

For qualitative responses, answers during the interviews should be grouped together to identify common patterns or themes that can help you in interpreting results and findings. *Please see Annex for examples and templates.*

Most importantly, store your records and relevant information safely—make sure you keep these records in a cabinet, away from fire and flood. You can also display this in your multipurpose halls or local village halls. Update your information regularly.

## Some tips for conducting your monitoring

**Be transparent with the communities!** It is necessary that at the start of the implementation of the monitoring, the process and its aims are clearly explained including the purposes of the visits and all the activities that are intended to be carried out in the project area. This helps the community to be clear about the sequence of the activities, and more importantly, to understand why the monitoring is relevant to them.

**Constant coordination with contact persons and key informants!** Our field experiences have proven that it is very helpful to work with the same contact persons and informants over time. In most cases they gradually take on lead roles for the monitoring. This will standardize the data and ensure reliability. It is recommendable then to choose at least two members of the group or community as key contact partners and informants. This will help ensure the monitoring produces objective information, reducing bias.

**Cooperate with others!** Cooperation with other members of the community should be sought and other stakeholders should be informed about the activities, their results and their desired impact. This enables them to significantly contribute to the data collection, to be able to use the results, and to join common efforts. We have found it helpful to present the monitoring results in multi-stakeholder meetings and discuss the potential role of other stakeholders in taking action.

**Be patient!** As this manual shows that monitoring is a long process, the monitoring cannot be set up in just one community visit. The most valuable results can only be produced after the collection of two or more data sets, which allows for the analysis of trends.



## Planning and deciding on a response

Based on the monitoring results, stakeholders can decide what actions should be done to reduce or stop mercury use in ASGM. This can be accomplished through small-group consultations with the participation of the local government unit and residents who are directly involved or affected by the problem. A list of actions should be drawn and from this, the group should prioritize activities that must be immediately implemented. This is done through simple *Action Planning*. An action plan consists of a number of action steps to be brought about in the community<sup>15</sup>.

Effective planning addresses the questions: What actions/activities need to be carried out? Who will carry out the activities? When and how long will the activities take place? What are the resources needed to carry out the activities?

## Taking action

The seed of social change becomes evident when people come together to voice a single opinion and take collective action. It forces those in authority to examine the cause of the problem and take relevant action. Collective action can take on many such as writing a simple letter or petition, a street or online protests and hunger strikes.

When you try to advocate for change, think long term. Armed with data and sufficient information, you can plan your campaigns and activities in a manner that will help achieve the results that you want to push for.

There are simple and effective ways to plan your campaigns and lack of funds should not be a major hindrance. Collectively and even as individuals, there is so much you can do. You can invite a local media and give interviews about the issue, you can request a local radio station to give you a time slot and tell the public about the results of your monitoring.

Here are some important steps in building your campaign plan:

1. **Define what you want to happen** – clearly define the objectives of your campaign activities
2. **Research** – organize and use the information that you have gathered

3. **Plan your campaign activities** – clearly discuss and design campaign activities that are feasible for you to do

4. **Determine your targets** – map out the people and policy makers that can help institute the change

5. **Implement your plan** – this is where you execute your plan through engaging local media, lobbying with your local council officials and raising awareness

6. **Evaluate** – this is where you reflect the extent of achieving your goals and assess whether you were successful in executing your plan. Always remember that not fully achieving your objectives doesn't mean you have failed. In most instances, the experience provides you with valuable inputs in redefining strategies and leads you closer to achieving your objectives.

## Mapping out your targets

**Objective:** To be able to map out and identify your campaign targets and analyze their positions on the issue.

**Process:** Study the structure of your local council and map out the projects and special interests of your Council Officials at the municipal and provincial levels.

**Place them in categories:**

1. **Champions** – Those who support your cause and will contribute time to lobby others in order to help you.
2. **Allies** – Those who support your cause, will vote with you but will not lobby others and give much time to your cause.
3. **Undecided** – Those who have not made up their mind about what to do so you can help them decide by giving them information.
4. **Opponents** – Those who will not support your cause, will vote against you, but will not convince others to also oppose you.
5. **Big opponents** – Those who will not support your cause, will vote against you, and will convince and pressure others to oppose you.



TARGETS / NAMES	NOTES
Champions	
Allies	
Undecided	
Opponents	
Big Opponents	



## Contact BAN Toxics for support

Remember that you're not alone and that we're in this together.

The following tools and information materials are contained in the accompanying CD and can also be found at our website [www.bantoxics.org](http://www.bantoxics.org).

- Mercury Primer
- Byaheng Asoge Video
- Storybooks for Children: *Si Kit at ang Gintong Talakitok* and *Naughty Marty*
- IEC materials - posters, banners and t-shirt designs
- Mercury Free School Learning Guide for Elementary and High School Teachers
- Reports and publications such as: the National Strategic Plan for the Phase-out of Mercury in the Philippines; The Price of Gold; Mercury Trade in the Philippines; and Chasing Mercury - Measuring Mercury Levels in the Air in the Philippines.

You have the power to make things happen! So gather as many champions and allies as you can. For the undecided and opponents, talk to them about what you know. Ask BAN Toxics and ASGM partners to help you.



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<sup>1</sup> UNEP 2008.

<sup>2</sup> *Ibid.*

<sup>3</sup> BAN Toxics 2010.

<sup>4</sup> *Ibid.*

<sup>5</sup> <http://www.who.int/mediacentre/factsheets/fs361/en/>

<sup>6</sup> UNEP 2002, WHO/UNEP 2008., WHO/UNEP 2010.

<sup>7</sup> UNEP 2008.

<sup>8</sup> <http://www.unep.org/chemicalsandwaste/Metals/GlobalMercuryPartnership/ArtisanalandSmall-ScaleGold-Mining/tabid/3526/Default.aspx>

<sup>9</sup> World Gold Council, <http://www.gold.org/gold-mining/interactive-gold-mining-map>

<sup>10</sup> Based on BAN Toxics mercury Inventory activities in South Cotabato and Mt Diwata in 2012.

<sup>11</sup> Ministry of the Environment, Japan 2013.

<sup>12</sup> BAN Toxics 2010.

<sup>13</sup> SNV - University of Hawaii 2007.

<sup>14</sup> Brenda 1998.

<sup>15</sup> Retrieved from <http://ctb.ku.edu/en/table-of-contents/structure/strategic-planning/develop-action-plans/main>.

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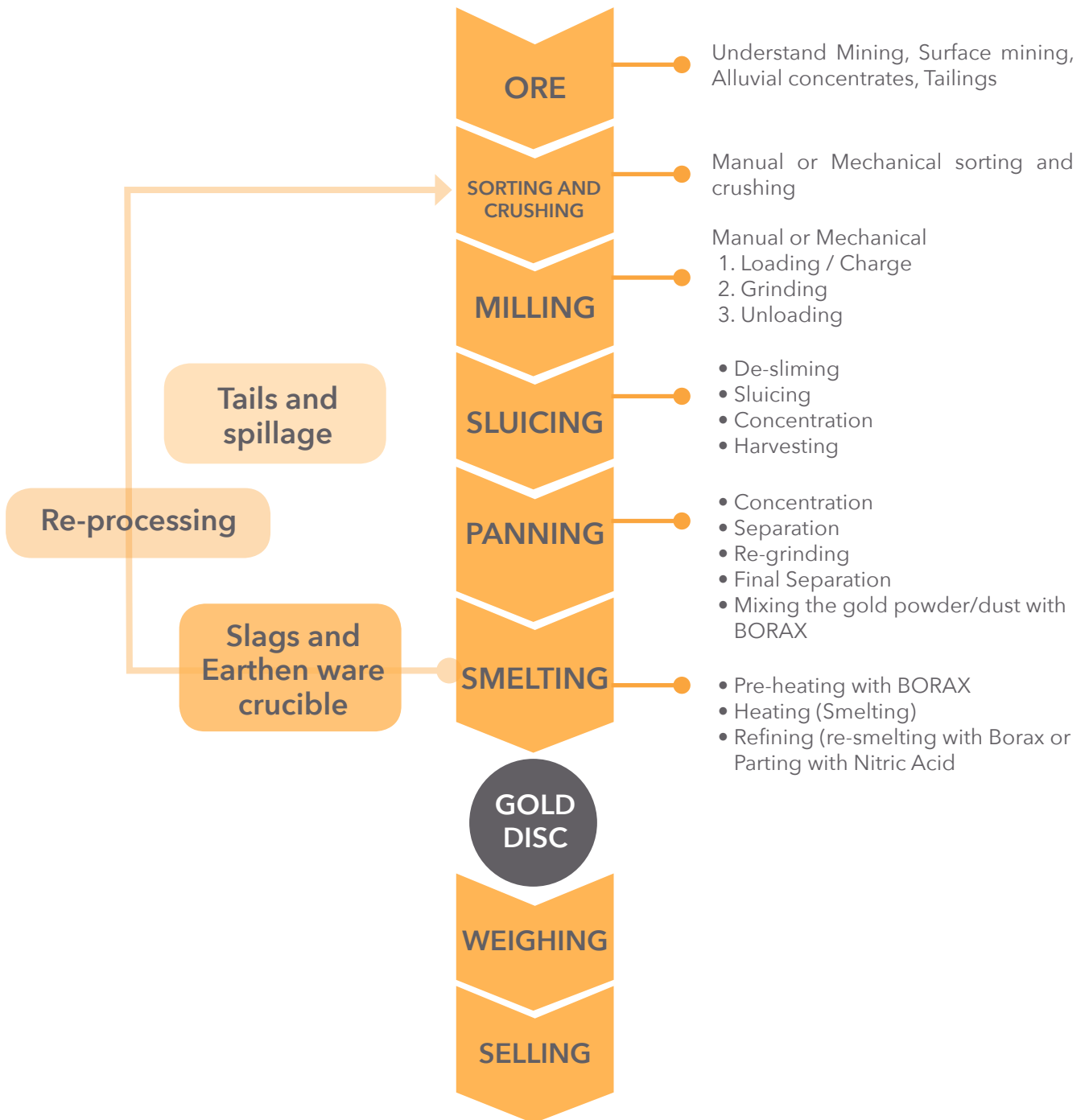
UNEP. (2008). The Mercury Issue. Retrieved March 7, 2015 from [http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/AwarenessPack/English/UNEP\\_Intro\\_UK\\_WEB.pdf](http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/AwarenessPack/English/UNEP_Intro_UK_WEB.pdf)

Philippine Society of Clinical and Occupational Toxicology. Health Assessment Form for ASGM Miners

# ANNEXES

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- 10 Annex 7: Options for Managing a Mercury Spill

## Annex 1: Mercury Free Gravity Concentration Method Flowchart





## Annex 2: General Information about the ASGM Community

**GENERAL INFORMATION ABOUT THE ASGM COMMUNITY**

**1. Location of the community to ASGM activities**

Layo ng tirahan mula sa A) Ball mill B) Minahan C) Torching station  
 <1 km    < 1-3 kms    3.1-5 km    5km

**2. Since when did mining activity start in the area?**

Mula pinanganak    < 1 year    1-3 years    3.1 – 5 years  
 5.1 – 10 years    > 10 years

**3. Types of Livelihoods in the Community**

URI NG TRABAHO	LUGAR NG TRABAHO	ILANG ARAW SA ISANG TAON	ILANG TAON
<input type="checkbox"/> Arangkador	_____	_____	_____
<input type="checkbox"/> Ball Miller	_____	_____	_____
<input type="checkbox"/> Blow Torch	_____	_____	_____
<input type="checkbox"/> Farmer	_____	_____	_____
<input type="checkbox"/> Fisherman	_____	_____	_____
<input type="checkbox"/> Housewife	_____	_____	_____
<input type="checkbox"/> Walang trabaho	_____	_____	_____
<input type="checkbox"/> Iba pa:	_____	_____	_____

**4. NUTRITIONAL HISTORY**

Observation: Anong mga pagkain ang madalas kinakain, anong uri at gaano kadalas itong kinakain?

	75-100% of the time	25-74% of the time	< 25% of the time	not at all
<input type="checkbox"/> Fish	1	2	3	4
<input type="checkbox"/> Seafoods	1	2	3	4
<input type="checkbox"/> Seaweed	1	2	3	4
<input type="checkbox"/> Vegetables	1	2	3	4
<input type="checkbox"/> Cassava	1	2	3	4
<input type="checkbox"/> Others	1	2	3	4

**5. SAAN NANGGAGALING ANG TUBIG NA**

INIINOM?	PANLUTO?	PANLIGO?
<input type="checkbox"/> Water District	<input type="checkbox"/> Water District	<input type="checkbox"/> Water District
<input type="checkbox"/> Deep Well	<input type="checkbox"/> Deep Well	<input type="checkbox"/> Deep Well
<input type="checkbox"/> Spring	<input type="checkbox"/> Spring	<input type="checkbox"/> Spring
<input type="checkbox"/> Iba pa: _____	<input type="checkbox"/> Iba pa: _____	<input type="checkbox"/> Iba pa: _____

**5. HEALTH HISTORY (Most common illnesses in the Community)**

<input type="checkbox"/> Tigdas	<input type="checkbox"/> Hypertension _____
<input type="checkbox"/> Bulutong	<input type="checkbox"/> Diabetes _____
<input type="checkbox"/> Dengue	<input type="checkbox"/> Sakit sa bato _____
<input type="checkbox"/> Typhoid	<input type="checkbox"/> Sakit sa atay _____
<input type="checkbox"/> Tuberculosis/Primary Complex	<input type="checkbox"/> Cancer _____
<input type="checkbox"/> Sakit sa balat	
<input type="checkbox"/> Iba pa _____	
<input type="checkbox"/> Allergies (specify _____)	
<input type="checkbox"/> Cancers (specify _____)	

## Annex 3: Individual Health Assessment Form

**Note:** This health assessment form can be used with other activities contained in the handbook. To administer this questionnaire more effectively, the facilitator may need to have some medical background or may need to undergo specific training. If you don't have medical background and need assistance with this questionnaire, you may contact BAN Toxics.

History and Health Related QUESTIONNAIRE			
BILANG:	<input type="checkbox"/> <input type="checkbox"/>		
PETSA NG PANAYAM:	<input type="checkbox"/> <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/>		
	Mm dd yy		
PANGALAN:	_____		
KAPANGANAKAN:	_____		
Petsa:	<input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/>		
	Mm dd yy		
Saan ipinanganak?	_____		
EDAD:	_____ years	_____ months	
KASARIAN:	<input type="checkbox"/> Babae	<input type="checkbox"/> Lalaki	
TIRAHAN	_____		
Layo ng tirahan mula sa A) ball mill B) minahan C) torching station			
<input type="checkbox"/> <1 km <input type="checkbox"/> < 1-3 kms <input type="checkbox"/> 3.1-5 km <input type="checkbox"/> 5km			
TAON NG PANINIRAHAN SA KASALUKULANG TIRAHAN:			
<input type="checkbox"/> Mula pinanganak <input type="checkbox"/> < 1 year <input type="checkbox"/> 1-3 years <input type="checkbox"/> 3.1 – 5 years			
<input type="checkbox"/> 5.1 – 10 years <input type="checkbox"/> > 10 years			
ANTAS/GRADO huling napasukan:			
<input type="checkbox"/> Wala <input type="checkbox"/> kinder <input type="checkbox"/> Grade 6 Graduate <input type="checkbox"/> High School Graduate			
<input type="checkbox"/> College Graduate <input type="checkbox"/> Iba pa _____			
<b>TRABAHO NG PASYENTE</b>			
URI NG TRABAHO	LUGAR NG TRABAHO	ILANG ARAW SA ISANG TAON	ILANG TAON
<input type="checkbox"/> Arangkador _____	_____	_____	_____
<input type="checkbox"/> Ball Miller _____	_____	_____	_____
<input type="checkbox"/> Blow Torch _____	_____	_____	_____
<input type="checkbox"/> Farmer _____	_____	_____	_____
<input type="checkbox"/> Fisherman _____	_____	_____	_____
<input type="checkbox"/> Housewife _____	_____	_____	_____
<input type="checkbox"/> Walang trabaho _____	_____	_____	_____
<input type="checkbox"/> Iba pa: _____	_____	_____	_____
<b>TRABAHO NG PASYENTE</b>			
URI NG TRABAHO	LUGAR NG TRABAHO	ILANG ARAW SA ISANG TAON	ILANG TAON
<input type="checkbox"/> Arangkador _____	_____	_____	_____
<input type="checkbox"/> Ball Miller _____	_____	_____	_____
<input type="checkbox"/> Blow Torch _____	_____	_____	_____
<input type="checkbox"/> Farmer _____	_____	_____	_____
<input type="checkbox"/> Fisherman _____	_____	_____	_____
<input type="checkbox"/> Housewife _____	_____	_____	_____
<input type="checkbox"/> Walang trabaho _____	_____	_____	_____
<input type="checkbox"/> Iba pa: _____	_____	_____	_____
PANINIGARILYO:	PASYENTE	ASAWA	
Naninigarilyo?	<input type="checkbox"/> Oo <input type="checkbox"/> Hindi	<input type="checkbox"/> Oo <input type="checkbox"/> Hindi	
Kung Oo, anong edad nagsimula _____	_____	_____	
Kung Oo, ilang sigarilyo sa isang araw? _____	_____	_____	

**PAG INOM NG ALAK:**

Umiinom ng alak?

Kung Oo, gaano kadalas?

Kung Oo, anong klase ng inuming Alak?

Dami ng iniinom (bote) sa bawat pag-inom \_\_\_\_\_

**PASYENTE** Oo  Hindi

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**ASAWA** Oo  Hindi

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**NUTRITIONAL HISTORY**

Anong mga pagkain ang madalas kinakain, anong uri at gaano kadalas itong kinakain?

	75-100% of the time	25-74% of the time	< 25% of the time	not at all
<input type="checkbox"/> Fish	1	2	3	4
<input type="checkbox"/> Seafoods	1	2	3	4
<input type="checkbox"/> Seaweed	1	2	3	4
<input type="checkbox"/> Vegetables	1	2	3	4
<input type="checkbox"/> Cassava	1	2	3	4
<input type="checkbox"/> Others	1	2	3	4

**SAAN NANGGAGALING ANG TUBIG NA****INIINOM?** Water District Deep Well Spring Iba pa: \_\_\_\_\_**PANLUTO?** Water District Deep Well Spring Iba pa: \_\_\_\_\_**PANLIGO?** Water District Deep Well Spring Iba pa: \_\_\_\_\_NALILIGO KA BA SA ILOG?  Oo Hindi**HEALTH HISTORY****Past History** Tigdas Bulutong Dengue Typhoid Tuberculosis/Primary Complex Sakit sa balat Iba pa: \_\_\_\_\_ Allergies

(specify \_\_\_\_\_)

 Cancers

(specify \_\_\_\_\_)

**Family History (Specify member)** Hypertension \_\_\_\_\_ Diabetes \_\_\_\_\_ Sakit sa bato \_\_\_\_\_ Sakit sa atay \_\_\_\_\_ Cancer \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

## Annex 4: General Guidelines in Conducting Interviews and Focus Group

### Discussions

Adapted from: How to Conduct Focus Groups by Elliot and Associate, 2005.  
[https://assessment.trinity.duke.edu/documents/How\\_to\\_Conduct\\_a\\_Focus\\_Group.pdf](https://assessment.trinity.duke.edu/documents/How_to_Conduct_a_Focus_Group.pdf)

#### Interview introduction

Always give an introduction when speaking with a subject who has agreed to be interviewed. You can start by thanking the interviewee:

*Thank you for agreeing to be interviewed. We really appreciate your contribution to our community-based monitoring activity.*

#### Introductions

Introduce yourself and the other team facilitators by giving your name and the organizations you work for (if applicable).

State the purpose of the focus group discussion or interview

*As community volunteers, we would like to find out the level of mercury pollution in our community. Your input and thoughts about this issue is very important for us.*

#### Ground rules

1. We want you to do the talking  
*We would like to hear from you and this is your opportunity to share your thoughts on the issue.*
2. There are no right or wrong answers  
*Your experiences and opinions are important. Speak up whether you agree or disagree with some of the questions that we will be asking you to answer.*
3. What you will share stays here  
*We want you to feel comfortable sharing when sensitive issues come up.*
4. We will be tape recording (if applicable)  
*We want to capture everything you have to say. We don't identify you/anyone by name in our report. You will remain anonymous.*

#### Mood setting exercise

Before asking the first focus group question, an ice-breaker can be inserted to increase comfort and level the playing field. For example, *"If you win 20 million pesos in the Lotto, what would you do with the money?"*

#### Additional tips

The interviewer has a responsibility to adequately cover all prepared questions within the time allotted. S/he also has a responsibility to get the respondent to talk and fully explain his/her answers. Some are some helpful tips:

- *"Can you talk about that more?" "Help me understand what you mean" and "Can you give an example?"*
- It is good moderator practice to paraphrase and summarize long, complex or ambiguous comments. It demonstrates active listening and clarifies the comment for everyone in the group.
- The interviewer must remain neutral, refrain from nodding/raising eyebrows, agreeing/disagreeing or praising/denigrating any comment made.
- An interviewer must tactfully deal with challenging participants. Here are some appropriate strategies:
  - o Self-appointed experts: *"Thank you. What do other people think?"*
  - o The dominator: *"Let's have some other comments."*
  - o The rambler: Stop eye contact; look at your watch; jump in at their inhale.
  - o The shy participant: Make eye contact; call on them; smile at them.
  - o The participant who talks very quietly: Ask them to repeat their response more loudly.
- When the discussion is complete the interviewer/facilitators thanks the respondent.

## Recording and summarizing your data

- Immediately go over guide questions and debrief after the interview. Make sure to label all tapes and notes with the date, time (if more than one interview per day), and name of the respondent.
- In order for all participants' comments to be understandable and useful, they must be boiled down to essential information using a systematic and verifiable process. Begin by transcribing all tape interview and inserting notes into transcribed material where appropriate.
- Clean up transcripts by stripping off nonessential words. Simultaneously assign each participant comment/quote a separate line on the page as well as each new thought or idea therein. Label each line with the participant and group number.
- Each line is then entered into an Excel database as follows:
  1. Use a separate Excel database spreadsheet for each group.
  2. Within each spreadsheet, use one sheet per question.
  3. Label three columns on each sheet.
    - a. One column for coding
    - b. One column for the participant
    - c. One column for responses
  4. Enter each separate response or idea on a separate line with participant ID attached. The coding column is filled in during the next phase (analysis).

## Analysis

1. When all comments have been entered, look for common categories or themes across the entries for each question. The most ideal situation is to ask several people to participate in this process.
2. Once consensus has been achieved regarding the best categories for organizing the data, assign a number or letter to each category.
3. Then assign the number/letter of the category that best fits to each entry on the sheet.
4. Use the Excel 'Sort' function to group entries by the categories you have assigned to them.
5. If some entries seem inconsistent for their category, consider re-categorizing or adding another category. It may also be apparent that one or more categories can be collapsed.
6. Arrange categories from those with the largest number of entries to those with the smallest.
7. Repeat for each group.

## Synthesis

1. Identify category and sub-category heading titles.
2. Write a short paragraph summarizing findings for each sub-category possibly noting similarities and differences across groups.
3. Add powerful quotes to each sub-section.

As an alternative to the spreadsheet method described here, you can also use a manual approach to analyzing focus group data. Make a copy of the transcript after it has been cleaned and labeled. Working on a large table, cut entries into separate strips and run a glue stick over the back. Categorize by sticking entries onto separate sheets of paper labeled with broad headings. Re-categorize as indicated until you are satisfied with your groupings. Enter the data into a Word document.

Once focus group findings are organized in the synthesized format they are ready for presentation. If a more formal report is required, findings can be written up in a narrative format that includes an executive summary, background section, methods used, major findings, conclusions and recommendations.

## Annex 5: Mercury and ASGM Primer

### What are some simple steps to take to prevent or reduce mercury exposure?

For consumers, the easiest way is to avoid mercury-containing products and use mercury-free alternatives. Moderate intake of large predatory fish species as they may be contaminated with mercury, e.g. swordfish, mackerel, blue marlin, etc. If pregnant or planning to be pregnant it is best to avoid these types of fishes.

For manufacturers or distributors, proper labeling of their products if it contains mercury. More importantly for manufacturers, there should phase-out mercury and distributors should focus on import mercury-free products. Both manufacturers and distributors should be held accountable through Extended Producer Responsibility to ensure that the mercury-containing products they sell or distribute is properly managed at end of life.

For the government, strict controls are needed starting with mandatory labeling of products, phase-out of mercury in products and commerce, and producer responsibility should be mandated as well.

For all three actors there should be proper mercury waste management. Products like empty batteries, broken thermometers, dental amalgam, and broken lamps should be properly disposed of or stored.



<sup>1</sup>[http://www.epa.gov/epaospr/press\\_releases/2006/0111\\_01q1n2.asp](http://www.epa.gov/epaospr/press_releases/2006/0111_01q1n2.asp). Note that some states peg the amount of mercury released from small-scale gold mining up to 30 grams emitted per 1 gram of gold released.

<sup>2</sup>[http://www.epa.gov/epaospr/press\\_releases/2007/03/28.pdf](http://www.epa.gov/epaospr/press_releases/2007/03/28.pdf)

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### What is Mercury?

Mercury, or in Tagalog "isaga", occurs naturally in the environment and exists in a large number of forms. Mercury is a constitutive element of the earth, a heavy metal. In pure form it is known as "elemental" or "metallic" mercury. Mercury is rarely found in nature as a pure liquid metal, but rather within compounds.

### What are the forms of mercury?

- Elemental mercury is a heavy, silvery-white metal that is liquid at usual temperatures and atmospheric pressures. Mercury vaporizes readily at usual room temperatures. Most of the mercury encountered in the earth's atmosphere is elemental mercury vapor.
- Inorganic mercury compounds, e.g. mercuric sulfide (HgS). These compounds are called mercuric salts. Most inorganic mercury compounds are white powders or crystals, except for mercuric sulfide, which is red and turns black after exposure to light.
- Organic mercury: When mercury combines with carbon, the compounds form what is called organic mercury. There is a potentially large number of organic mercury in the environment, the most common is methyl mercury.

### Why is Mercury a concern?

- Mercury is a toxin and is harmful to humans and wildlife. Significant adverse impacts on human health and the environment have been documented around the world. Some populations are especially susceptible to mercury exposure, most notably the fetus, the newborn and young children because of their developing nervous systems.
- Mercury is present throughout the environment. As an element mercury can not be created nor destroyed by any chemical means. Mercury levels in the environment have increased considerably since the onset of the industrial age. Mercury is now present in various environmental media and food.
- Mercury is persistent and cycles globally. Once mercury is released into the environment it persists and cycles through various media, e.g. air, water, etc.



Mercury that is deposited can change form into methyl mercury (through microbial action). Methyl mercury has the capacity to collect in organisms (bioaccumulate) and concentrate up food chains (biomagnify), especially in the aquatic food chain.

### How toxic is mercury to humans?

Mercury and its compound are highly toxic, especially to the developing nervous system. The degree of toxicity to humans and wildlife depends on the chemical form of mercury, the amount, the exposure pathway, and the vulnerability of the person exposed.

The primary form of mercury that is of concern is methyl mercury. This compound readily passes the placental barrier and blood brain barrier, and is a potent neurotoxicant, which can cause adverse effects on the developing brain. Studies have shown that methyl mercury in pregnant women's diets can have subtle, persistent adverse effects on children's development. Moreover, some studies suggest that small increases in methyl mercury exposure may cause adverse effect on the cardiovascular system. It is believed that many people and wildlife are presently exposed at levels that pose risks of these and possibly other effects.

### Where does mercury come from?

Mercury is released by natural sources like volcanoes, by evaporation from soil and water surfaces, as well as through the degradation of minerals and forest fires. Mercury is also contained as a trace element in coal. The large use of coal-fired power plants in generating electricity, make mercury emissions to the air from this source among the world's largest.

Furthermore, mercury is available on the world market from several sources, e.g. mines as a by-product of mining or refining of other metals (such as zinc, gold, silver) or minerals, as well as refining of natural gas, recycled mercury recovered from spent products and waste from industrial processes.

Mercury is also found in many products, e.g. fluorescent lamps, thermometers, dental amalgam fillings, batteries, vaccines (as preservative in form of ethyl mercury in thimerosal), snaps and creams (as a bactericide and/or whitening agent).



### How might I be exposed to mercury?

Primary exposure of mercury to humans is through diet. However, people can also be exposed to mercury by breathing in air or drinking water contaminated with mercury compounds.

In the Philippines, the main source of mercury pollution is from small-scale gold mining (SSM). There are about 310,000 people engaged in SSM in the country. It is conservatively estimated that for every gram of gold retrieved, two to five grams of mercury are released into the environment which threatens to pollute rivers and agricultural areas.



### What impacts might mercury have on the environment?

Mercury and its compounds are toxic in aquatic life even at low concentrations. The amount of mercury in one thimposeter, when diffused in an aquatic environment, can contaminate a 20-acre lake.

### What is the current government policy on mercury?

The Department of Environment and Natural Resources (DENR) requires that importers, distributors, manufacturers, transporters of products with mercury obtain an importation clearance, and register with a license to use and purchase from the DENR - Environmental Management Bureau. They are also required submit quarterly reports to the DENR - Environmental Management Bureau, as well as retain records of their activities and transactions. The government creates limits for the use of mercury-containing products.

Containers or vessels containing mercury must be properly labeled and should be stored in secure places, with provisions for appropriate emergency responses in case of accidents. Any violators of the requirements specified will be subjected to administrative and criminal penalties and liabilities. In Aug. 11, 2006, the Department of Health issued Administrative Order 21 mandating the gradual phase-out of all mercury containing devices in all hospitals and health care facilities by 2010.



## Annex 6: Proper Handling of Mercury and Mercury-Containing Equipment and Products

Adapted from the United States Environmental Protection Agency website

<http://www.epa.illinois.gov/topics/waste-management/waste-disposal/household-hazardous-waste/mercury/index>

### **What You Should Do If You Have Elemental Mercury in Your Home**

Many people have containers of elemental mercury in their homes left over from science projects or other sources. Elemental mercury is a shiny, silver-gray metal that is liquid at room temperature. If you have elemental mercury in your home, you need to exercise extreme caution with it and package it to contain any leaks.

### **Packaging Mercury for Storage and Transportation**

- All mercury-containing products or containers of mercury should be placed inside larger container with a tight fitting lid.
- Oil absorbent material (for example, cat litter) should be placed around the product to protect it from breaking or sudden shocks.
- Clearly label storage container as "Mercury - DO NOT OPEN".
- If transporting mercury, place container described above in a cardboard box and secure it so that the container does not tip over when shifting or sliding during sudden stops or turns. Transport in the back of a pickup truck or in a car trunk, not inside the passenger area.



## Annex 7: Proper Handling of Mercury and Mercury-Containing Equipment and Products

\*Applies to Health Care Facilities, Homes and Schools

Sources: Management and Storage of Mercury Waste ([http://www.who.int/water\\_sanitation\\_health/health-care\\_waste/module20.pdf](http://www.who.int/water_sanitation_health/health-care_waste/module20.pdf)) and Handling Options for Mercury-Containing Products in the Home <http://www.epa.illinois.gov/topics/waste-management/waste-disposal/householdhazardous-waste/mercury/index>)

Note: The WHO powerpoint presentation "Management and Storage of Mercury Waste" is available in the accompanying CD kit.

### A. What you need to clean up a spill

#### 1. Personal protective equipment (PPE)

- A pair of rubber or nitrile gloves
- Safety goggles or protective eyewear
- Coveralls, apron, and other protective clothing
- Disposable shoe covers
- Respiratory protection

#### 2. You will also need:

- Flashlight
- Plastic-coated playing cards or thin pieces of plastic
- Small plastic scoop or plastic dust pan
- Tweezers
- Eyedropper or syringe (without the needle)
- Duct tape or sticky tape
- "Danger: Mercury Waste" labels to put on waste containers

#### 3. Other things needed: Containers for mercury waste:

- Air-tight, sealable plastic bags (small and large sizes, thickness: 2 to 6 mils, or 50 to 150 microns)
- Small, air-tight, rigid plastic container with some water or vapor suppression agent
- Air-tight, puncture-resistant, rigid plastic or steel jar or container with a wide opening
- Regular plastic waste bags (thickness: 2 to 6 mils, or 50 to 150 microns)
- Plastic tray

#### 4. Other things needed: Vapor suppression agents

- Sulfur powder (may be available from pharmacies) or
- Zinc or copper flakes (may be available from hardware stores) or
- Commercial absorbent pads or vapor suppressants, and
- Brush to remove powder or flakes

### B. How to clean up a mercury spill

#### 1. Quickly determine the extent of the spill

2. Immediately block off foot traffic for a radius of about 2 meters around the spill

3. Contain the spill. Use rags or impervious materials to prevent mercury balls from spreading or falling into cracks or drains

4. Evacuate the immediate area. Give priority to pregnant women and children

5. Minimize the spread of vapors to interior areas. Close doors to interior areas, turn off ventilation or air conditioning that circulates air to other areas

6. Reduce vapor concentrations in the spill area if possible. Open doors or windows that lead to outside areas that are free of people

7. Prepare for clean-up by getting the mercury spill kit and removing your jewelry, watch, mobile phone and other metallic items that could amalgamate with mercury; cover eyeglass metal frames

8. Put on PPE. Put on old clothes, apron or coveralls, shoe covers, rubber or nitrile gloves, eye protection and respiratory protection

9. First remove visible mercury balls and broken glass beginning from the outer edge of the spill and moving towards the center of the spill

- Place the wide mouth jar on the plastic tray
- Use tweezers to remove broken glass
- Use playing cards or pieces of plastic to slide mercury balls into the scoop then into the jar over the tray to catch spillage
- Use the eye dropper or syringe to capture small mercury beads

10. Search and remove tiny mercury droplets

11. Shine the flashlight at low angles to see reflections of tiny droplets; use sticky tape to pick up tiny droplets and place the tape with the mercury in a sealable plastic bag

12. Clean up cracks and hard surfaces

- Sprinkle sulfur powder, zinc or copper flakes on cracks, floor crevices and hard surfaces that have come in contact with mercury; use a brush to collect the powder or flakes and put them in a resealable bag
- Wipe with vinegar-soaked and peroxide-soaked swabs

13. Remove contaminated soft material. Use a knife to cut out contaminated carpets, rugs, etc. and put in a resealable bag

14. Clean out contaminated drains. Carefully transfer any mercury in the J- or S- trap and transfer to an airtight container; replace the trap

15. Dispose of decontaminated material in leak-proof, sealable plastic bags and dispose as mercury waste

16. Label and seal all contaminated material

17. Wash hands and all exposed skin with soap and water

18. Ventilate the spill area

19. Place heaters and fans to volatilize residual mercury and to blow contaminated air to the outside for at least 48 hours

20. For facilities with central ventilation, increase air exchange rates for several days

### What NOT to do during a mercury spill

- Do not use a regular vacuum cleaner. It will spread more mercury vapors and will contaminate the vacuum cleaner
- Do not wash contaminated clothing or fabrics in a washing machine. It will contaminate the machine and wastewater
- Do not use a large broom to sweep mercury. It could break up mercury balls into smaller droplets
- Do not pour mercury down the drain. It will contaminate the plumbing system and septic or sewage treatment system for years to come
- Do not spread mercury with your shoes. Use disposal shoe covers or decontaminate shoes

### Prepare spill kits with all the items listed

- Include a step-by-step clean-up procedure as a guide
- Place spill kits in readily accessible locations
- Train staff on the use of the spill kits
- Replace spill kit contents that have been used after every spill





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