

PARTICIPATORY RESEARCH AND ACTION GUIDE TO MONITORING MERCURY USE IN ASGM IN THE PHILIPPINES:

A COMMUNITY-BASED MONITORING APPROACH



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This publication is intended to serve as a guide. The information contained in this handbook mainly springs from the wealth of knowledge gathered on the ground and added research conducted by BAN Toxics with all reasonable care and diligence. Copyrights of the content and images except those that are references are owned by BAN Toxics. Any third party who rely on information contained in this report, or their interpretation thereof, do so at their own risk.

Like other kinds of heavy metal pollution, mercury pollution is one of the equally dangerous environmental problems that we have often ignored. While there exists a Clean Air Act, which lists air pollutants — mercury among them — for monitoring, the government has only focused on the visible and familiar forms of air pollution such as carbon dioxide (CO₂), Chlorofluorocarbons (CFCs), oxides of nitrogen and sulphur (NO_x, SO_x) and volatile organic compounds (VOCs). Artisanal and Small-scale Gold Mining (ASGM) is the most significant contributor to the total annual mercury release in the country.

This participatory research guide to monitoring mercury use and pollution will help local communities gather information, report and act on it. The information gathered will also help local governments gain first-hand knowledge about the current situation in the ASGM areas, their development aspirations and the actions to be taken.

This community-based monitoring guide is a powerful tool that local stakeholders and BAN Toxics can bring to national governments and international bodies for improved policy and monitoring of existing policies.

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 building the capacity of local ASGM partners to take a step towards their own development and sustain it.

BAN Toxics (BT) is an independent, non-profit, non-governmental, environmental organization that seeks to:

1. Promote environmental justice in the Philippines and the Asian region, ensuring that developing countries in the region do not bear a disproportionate burden of pollution coming from developed countries.
2. Prevent toxic trade in products, wastes, and technologies, particularly trade from developed to developing countries in the Asian region through the promotion of self-sufficiency in waste management, clean production, toxics-use reduction, and other sustainable and equitable practices or methodologies.
3. Reach out and work in solidarity and partnership with allied groups locally and regionally in Asia, striving to instill a broader consciousness of the interrelatedness of each community, each country, within the region and to uphold our collective fundamental human right to life and to live in a healthy and peaceful environment.
4. Promote a new earth economics that accounts for nature's services, and the disservices from pollution, that internalizes all costs, including those transferred to the global commons, disenfranchised communities, the environment and the future.

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5. Develop local and regional initiatives through research, investigation, and policy dialogue with government and grassroots organizations in order to actively share information and expertise through workshops, conferences, newsletters, reports, films, web features, and through other similar or as yet undeveloped media.

BAN Toxics works closely with local, national and international environmental NGOs, intergovernmental organizations, and academic institutions using both local and international campaigning, capacity-sharing and bridge-building between activists in Asia, and throughout the world.

BAN Toxics is a duly registered non-profit, non-governmental organization with the Philippine Securities and Exchange Commission.

We are based in Quezon City, Philippines.

ACRONYMS

ASGM	Artisanal and Small-scale Gold Mining
BT	BAN Toxics
CBM	Community-based Monitoring
DENR	Department of Environment and Natural Resources
DOH	Department of Health
FPE	Foundation for the Philippine Environment
Hg	Mercury
HgS	Mercuric Sulfide
LGU	Local Government Unit
PSCOT	Philippine Society of Clinical and Occupational Toxicologists
UNIDO	United Nations Development Organisation
USDOS	US Department of State

PART I: THE PROBLEM WITH MERCURY

MERCURY— A PERSISTENT ORGANIC POLLUTANT

Mercury, as an element, exists 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 occurs naturally in the environment and exists in a large number of forms.

- a. **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.
- b. **Inorganic mercury compounds**, e.g. 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** is formed when elemental mercury combines with carbon. There is a potentially large number of organic mercury in the environment; the most common is methyl mercury.

HEALTH IMPACTS

WHO ARE AT RISK?¹

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.

¹ The Mercury Issue. www.unep.org

WHAT ARE THE SIGNS AND SYMPTOMS OF MERCURY POISONING?²

The earliest effects of methylmercury poisoning in adults are non-specific symptoms such as paresthesia³, 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, spasticity⁴, 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

Minamata disease is a form of severe methylmercury poisoning first identified in Minamata, a city on the island of Kyushu in southern Japan in 1956. Between 1932 and 1968, an acetaldehyde plant owned by the Chisso Corporation released effluents containing methylmercury compounds into

² The Mercury Issue, www.unep.org.

³ **Paresthesia** is a sensation of tingling, tickling, pricking, or burning of a person’s skin with no apparent long-term physical effect

⁴ **spasticity**, a condition in which muscles are continuously tight or stiff.

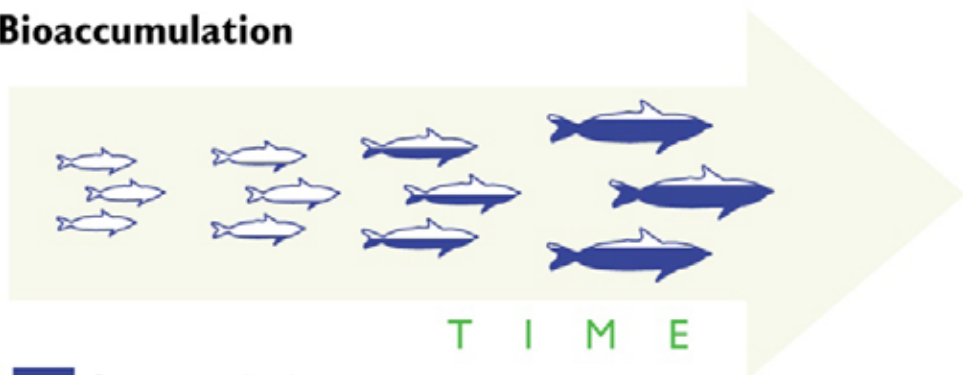
Minamata Bay and subsequently into the Minamata River and the Shiranui Sea. The methylmercury bioaccumulated in the shellfish and fish that make up an important part of the local diet. More than 200,000 people were exposed to the contamination. This led to chronic poisoning in residents of the coastal areas of Kumamoto and adjoining Kagoshima prefectures.

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

ENVIRONMENT IMPACTS

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 science 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.

Bioaccumulation

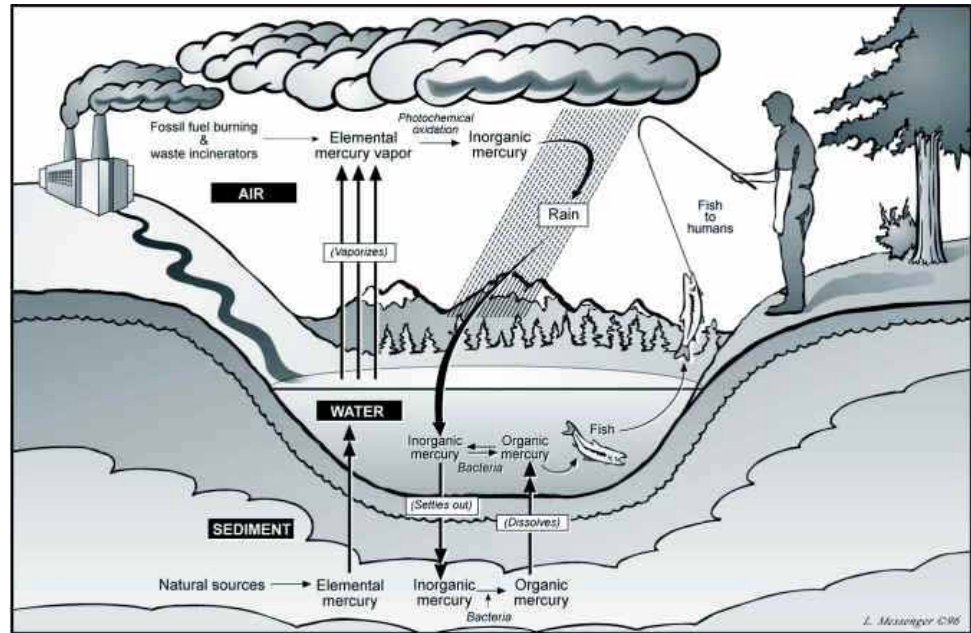


■ Contaminant levels



■ Contaminant levels

Biomagnification

ILLUSTRATION 1: SHOWS MERCURY EXPOSURE THROUGH EATING FISH CONTAMINATED WITH MERCURY

Conversion of elemental mercury to divalent mercury (inorganic mercury) may lead to its deposition to land and water bodies through rain or precipitation. It is in sea, lakes or rivers where inorganic mercury is converted into organic mercury, or methylmercury and spreads its way through (biomagnifies) the aquatic food chain. Methylmercury can be *bioaccumulated* in the bodies of fish which will eventually be eaten by other animals and humans.

Consumption of mercury-contaminated fish and shellfish, thus leads to the exposure of people other than small-scale miners. Children and pregnant women are more susceptible to the potential effects of mercury. Children who are exposed to similar levels of mercury will have a greater effect on their bodies as compared to the adults. Also, pregnant women can pass it 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 (below the official threshold), resulted in reduced intelligence and difficulties in various learning processes as compared to the offspring of women not exposed to mercury.

ILLUSTRATION 2 : AMALGAMATION METHOD IN ASGM



EXTRACTION



CRUSHING



GRINDING

Gold and Mercury Ratio

Whole ore amalgamation – 1:10 to 25

Amalgamation after grinding and panning – 1:1 to 3



GOLD: THE END PRODUCT



AMALGAM BURNING



MERCURY MIX
(WHOLE ORE
AMALGAMATION)



RECOVERY OF
SLURRY LADEN WITH
MERCURY



AMALGAMATION
AFTER GRINDING



RECOVERY OF
AMALGAM



SQUEEZED AMALGAM



SQUEEZING

WHAT ARE THE SIGNS AND SYMPTOMS OF MERCURY POISONING?

Let us do this quick exercise. Draw a line to match the signs and symptoms of mercury poisoning.

Tremor



Insomnia



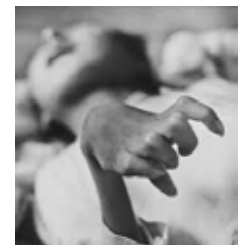
Minamata disease



Pneumonitis



“Erethism” or excessive degree of irritability



MERCURY USE IN ASGM

Artisanal and Small-Scale Gold Mining (ASGM) refers to mining activities that rely heavily on manual labor and uses rudimentary methods to extract and process gold on a small scale.

Artisanal and small-scale gold mining (ASGM) is one of the most significant sources of mercury release into the environment in the developing world. According to UNEP, it accounts for about 15% of the world's annual gold production.

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 total annual anthropogenic mercury emissions. This has been growing over the last decade along with the rise in prices of gold

Mercury use in ASGM in the Philippines started in the 70s and 80s. It has been estimated that around 300,000 people are directly engaged in this type of activity. Mercury release from the ASGM sector in the Philippines is conservatively estimated at 70 metric tons per year, making the industry the single largest emitter of mercury pollution in the country.

The small-scale gold mining activities utilizing mercury has been recorded in a number of provinces throughout the country such as: 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 amalgamation or the use of mercury. 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, 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.

According to a 2007 fact-finding mission, ASGM released an estimated 5 tons of mercury every year. This result is congruent to the previous investigations. A report by the Philippine Department of Health submitted to UNEP in 2001 concludes that some 140 tons of mercury is released annually to the environment from small-scale mining in Northern Mindanao.

The table below shows approximation of mercury releases based on a number of studies from various SSM communities in chronological order. Due to scarcity of data on small scale mining activities in the Philippines, the figures shown below is not a representative of the total release of mercury from SSM activities in the Philippines.

(Infographics here)

YEAR	ESTIMATED ANNUAL MERCURY RELEASE
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)
Early 90s	25 tons (Greer, 1993)
1986-1988	A total of 140 tons in 3 years from 53 mining communities (Appleton et al., 1999)

This statistic cited in various reports indicate that 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. 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.⁵

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 and washing auriferous gravels along riverbeds and streams. Underground mining, the most common method of ore extraction, requires digging up of tunnels to extract gold-bearing ores. 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. Under this method, a miner dives down underwater with a big suction hose to catch auriferous gravel and sand believed to be washed away from the mountains to the rivers and seas. In underground mining, before the ore is processed, the miners do assaying (sampling in the vernacular) 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 ores and bring them to the mills or plants for processing.

Ores 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 (ballmills or rod mills). To extract the gold, miners either employ sluicing and gravity concentration, amalgamation or cyanidation.

⁵ BAN Toxics, The Price of Gold.

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.

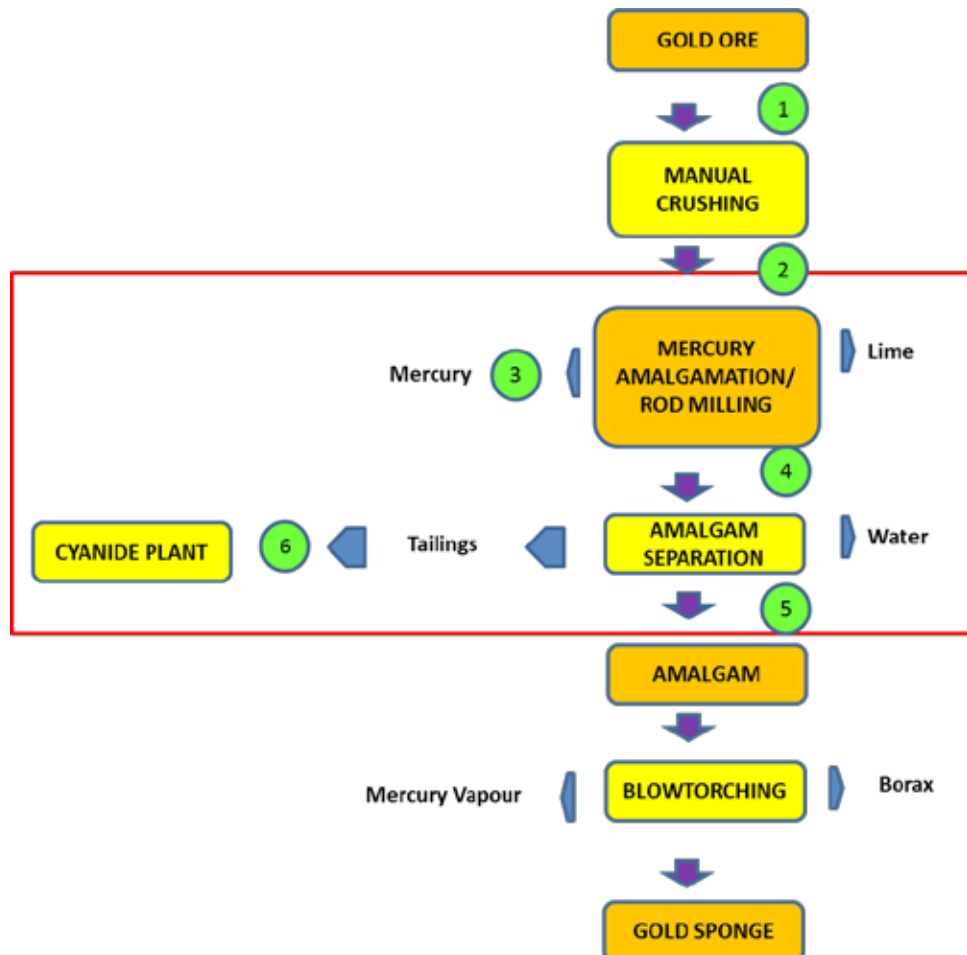
Cyanidation in the Philippines takes three forms: carbon-in-leach, carbon-in-pulp and heap leaching. The fastest and most commonly used among the three is carbon-in-pulp. This technique allows gold recovery within 72 hours by strongly agitating the mixed concentrates. In the province of Benguet in northern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

One of the major environmental destruction brought by ASGM is mercury pollution, which is widespread throughout the Philippines. The most popular method of recovering gold with the use of mercury by artisanal and small-scale gold miners is *amalgamation*. In 2008, the Department of Environment and Natural Resources (DENR) estimated that 400 tons of mercury is released annually and ASGM is known to be one of the largest emitter of mercury in the country.

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. It is transformed to methylmercury and spreads its way across the food chain. Mercury ends up in human bodies and bioaccumulates. It slowly poisons the human body and causes major health problems such as neurological damage, respiratory problems, musculoskeletal illnesses, and worst, death. Unfortunately, women and its developing fetuses, infants and children are more vulnerable to the effects of mercury with its irreversible damage to their neurological development.

MERCURY AMALGAM FLOWCHART



Reference : BAN Toxics. Deciphering Benguet Method. 2012

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.

People are exposed to mercury in ASGM in various ways:⁶

1. Mercury vapor also 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 --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.
2. Mercury dust is also carried on the clothing of miners and brought back to their homes in this manner.

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?

Sites contaminated with high concentrations of metallic 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.

⁶ Mercury Use in Artisanal and Small Scale Gold Mining, www.unep.org.

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 sediment 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.⁷

PART II: WHAT CAN YOU DO TO ADDRESS THE PROBLEM?

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 as well as some idea of the trends in performance⁸. In monitoring mercury use in ASGM, two approaches can be used, the technical and non-technical approaches.

TECHNICAL APPROACH THROUGH THE LUMEX RA 915+ MERCURY ANALYZER

The Lumex RA 915+ mercury analyzer, 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

⁷ The Mercury Issue, www.unep.org.

⁸ A Toolkit for Monitoring and Managing Community-Based Tourism. School of Travel Industry Management, University of Hawaii and SNV Asia Pro-Poor Sustainable Tourism Network.

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 of research laboratories and industry quality control around the world. The same equipment is used by the United States Environmental Protection Agency (US EPA) to monitor mercury during cases of emergency spill.

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 is normally being conducted to detect the presence of mercury in fish, sediments and water.

But this approach requires substantive capital to purchase lumex equipment. And most local communities in the 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 of the ASGM communities are located in the poorest, far-flung municipalities in the Philippines without access to technology or nearby laboratories to detect and monitor mercury pollution. 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 the community to enable them to make informed and speedy decisions relating to mercury pollution in their jurisdictions.

CBM is a mechanism to engage communities in natural resource management to address environmental issues in ways that contribute to local sustainability. Ecological CBM enabled community members affected by a particular environmental condition or resource depletion to gather and

Stakeholders are persons or groups who are directly or indirectly affected by a certain issue in the community. Stakeholders may include women, children and youth, teachers, health workers, local leaders, non-government organizations, religious groups or other groups who may be influential in creating an enabling environment.

Source: Stakeholder Engagement: A Good Practice Handbook for Companies doing Business in Emerging Markets. International Finance Corporation. 2007

feedback relevant information to the government or organizational body in charge. CBM enables concerned citizens, government agencies, industry, academe, community groups and local institutions to collaborate in monitoring, tracking, and responding to environmental issues of common community concern.⁹

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

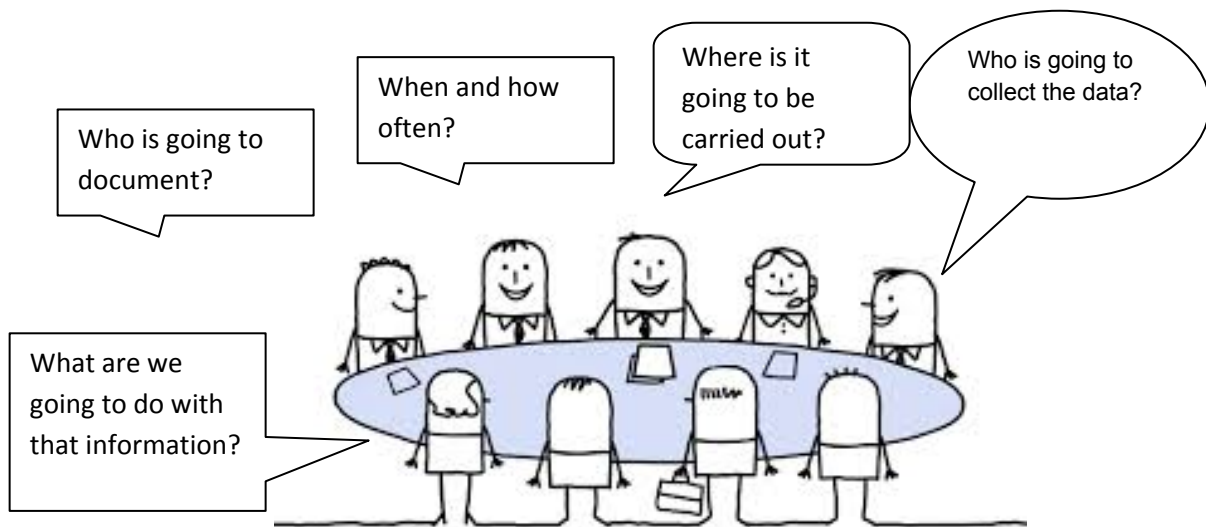
The community action guide is a tool that can be used to gather relevant information on mercury use in the mining communities. It is a “work in progress” guide that will allow the community stakeholders to manage and implement a monitoring program on an ongoing basis in accordance with the specific needs and capacity of the community.

⁹ http://en.wikipedia.org/wiki/Community-based_monitoring

SETTING UP YOUR COMMUNITY-BASED MONITORING SYSTEM

1. 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 this phase to provide them an opportunity to increase their understanding of the issue and to be able to contribute to the process and the direction of the monitoring activity. This will also provide the stakeholders sense of ownership -- one of the important factors towards improved decision making.



It is also important to remember that conducting a preliminary assessment of the area is equally important to provide some 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 analysed before the actual field trip (Refer to Annex A – General Information about the ASGM Community).

If you have access to internet, this preliminary data gathering is just a click away -- in most cases, this can be found on the web pages of the local government units that you may want to monitor.

2. DEVELOPING SITE INDICATORS

Indicators are the most important elements in monitoring mercury use. Indicators determine the signs to which the monitoring will focus on. The first set of indicators makes use of various *knowledge systems*¹⁰ as the determinants of mercury uses in ASGM communities; and the second set of indicators makes use of comparative information that allows you to see which practices deviate from the requisites of *Mercury Free Gravity Concentration Method* (See Annex B).

2.1. Knowledge Systems

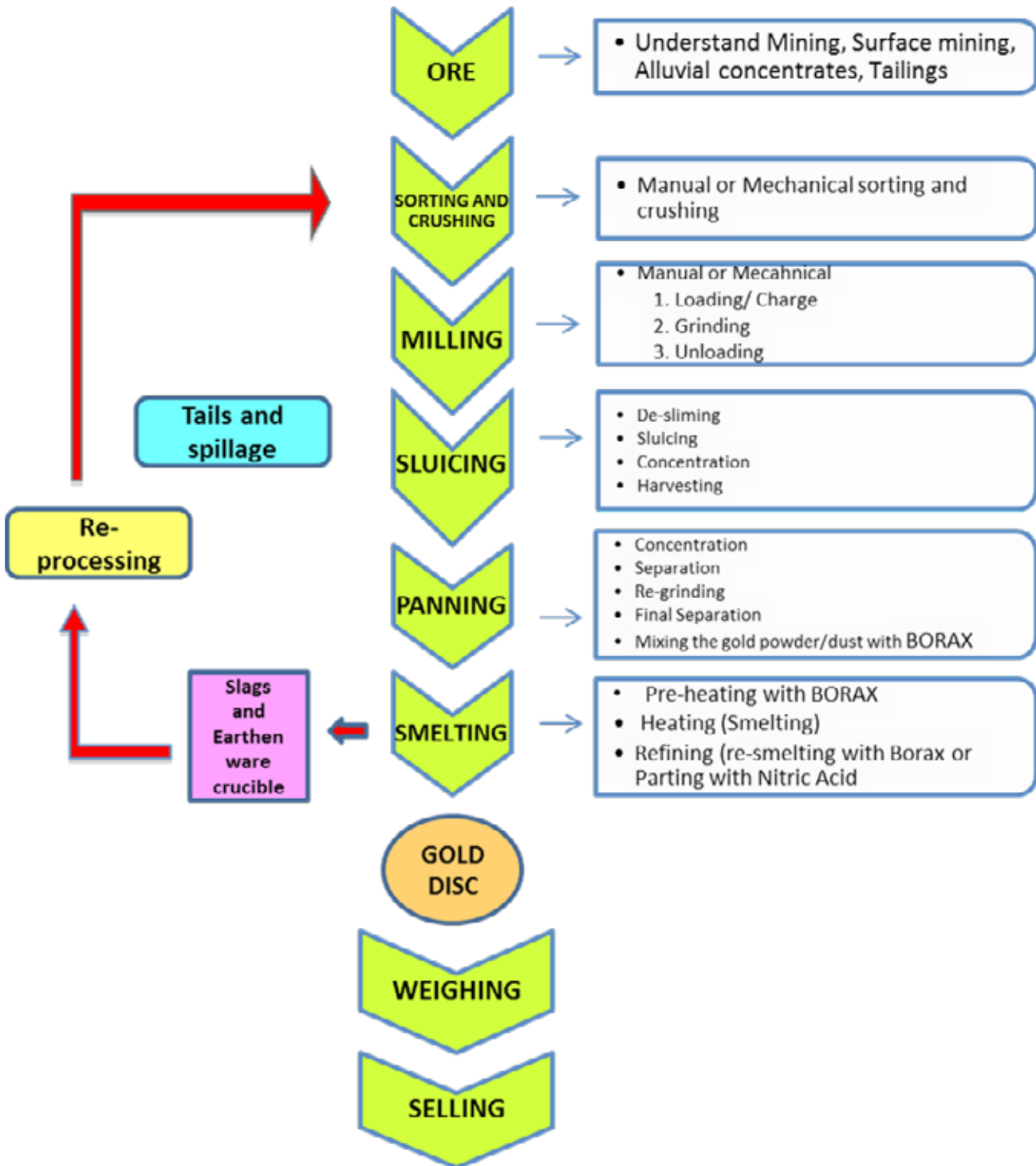
2.1.1. Traditional Knowledge indicators – these are indicators or information that usually come from the elders’ perspectives. These are questions that start with *how* and *when* mercury use started in ASGM. It is also relevant to trace back how mercury entered the community and how long since the people have been using it. These can give you some idea of the people’s culture and behavior in mining activity.

2.1.2. Science-Based Indicators – these are indicators or information that are identified through scientific process and analysis. *For detailed information please refer to added tools and resources of this section, on Deciphering Benguet Method Manual.*

2.1.3. Community-Based Indicators- these are indicators or information gained through everyday experiences. The information can be gathered from interviews with small-scale miners themselves, children, health workers, or community leaders. These will show the current trends of mercury use in the community as the people narrate their own experiences.

¹⁰ Brenda, P. A Guide to Community Based Monitoring for Northern Communities. 1998.

BOX 1: MERCURY FREE GRAVITY CONCENTRATION METHOD FLOW CHART



DATA GATHERING APPROACHES IN CBM

Community-based monitoring should be simple and economically feasible. This makes use of simple tools, but not limited to, community surveys, focus group discussions, key informant interviews, field observations, site surveys and many other methods. In the data collection exercise, select members of the team who represents the various interests of the community and by a group or individuals who are unbiased of 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 it should be kept direct, simple and easy to understand by the respondents. It should also easily generate important information about mercury use in the mining area.

Simple observation of what is visible in the mining communities can be a quick and easy tool 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. The person should be keen in recording notes of the different behaviors of the people in the community. Photo documentation will easily help you in remembering what have 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 need 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 participating in the research.

And that the information will be used by the advocates to improve the situation in ASGM, call on local government units, international bodies, civil society groups and local communities to take action.

ACTIVITY GUIDES: COMMUNITY BASED MONITORING TOOLS

Now, armed with basic knowledge on mercury, how it is being used to extract gold, its effects to health and environment and some basic techniques in data gathering, we can now proceed to the community and get as much information as we can!

The following activities serve as your guide to implementing your monitoring activity effectively. And depending on the number of members, relevance and timing, you can plan a day or time to do the recommended activities. Make sure that you keep notes of the results. We have included some 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 – to record and build a solid evidence on the direct effect of continued mercury use to 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, ask them to illustrate their story through drawing. At the end of your interview, you can also 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 pentel pens/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), hence, initially assess 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 Hg 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.

Children's knowledge and perception about mercury use and its impact Unfortunately, the impact of mercury targets the most vulnerable groups in the community – the children and young people in their puberty stages . For

ACTIVITY 2: HEALTHY BRAINS, BRIGHT MINDS.

example, a number of researches show that constant exposure to mercury even at low levels has serious physical effects to children and young adults at developmental stages of formation.

An effective awareness raising campaign involves the 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 in-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 (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 bond papers
2. Checklist of common signs and symptoms of mercury poisoning
3. BAN Toxic's storybooks for children
4. Notebook for facilitators

GUIDE QUESTIONS:

<p>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?</p>	<p>This will provide a backgrounder on the interviewee's family and their sources of income (which is mining).</p> <p>This is a good transition to the next questions. Note that the question about their parents' participation in mining was not immediately asked.</p>
<p>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?</p>	
<p>3. Do you participate in the mining activities? What specific step or steps in the mining process do you participate in?</p>	
<p>4. Do you smelt gold at home? 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? 8. Has mercury been spilled at school? 9. Has a mercury spill been vacuumed?</p>	<p>Mercury Storage School</p>
<p>10. Do you keep mercury at home? 11. How many grams/kilos? 1 bottle? 12. Where do you store it? 13. Do you play with it? What about your siblings?</p>	<p>Mercury Storage Home</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 IMPACT TO HEALTH AND ENVIRONMENT

Women in the Artisanal and Small Scale Gold Mining (ASGM) perform major roles and contribute significantly in the development of the sector. For the most part, ASGM communities have a lesser view of women's role in mining. For instance, 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 in turn greatly exposes them to mercury.

The perceived role of women in mining does not necessarily coincide with their critical role in the community. Women are the primary caregiver for the children in the community and are responsible for their health and well-being. They are also responsible for running the household and play a crucial role in maintaining the family expenses.

Yet, the gender dimensions of ASGM largely remain unknown and undervalued. 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:

Request and 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 industry. In this way, women can share their views about mercury, its effects (good or bad), its economic gain (low or high) and involvement of the family in sustaining family's income. Alternatively, ask the participants to illustrate their story through drawing. In closing, 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>2. How do you participate in the mining activities? What specific step or steps in the mining process do you participate in?</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, volume of mercury use in gold recovery per week/month.</p>

4. Do you burn amalgam at home? 5. Where do you store the amalgam smelting equipment after use?	
6. Do you keep mercury at home? 7. How much mercury do you keep at home? 8. Where do you keep it?	Mercury storage
9. Do you think this chemical (mercury) can have negative effects to the environment and people's health? How?	
10. Do you know anyone who has been poisoned by/became sick because of this chemical (mercury)?	The facilitator can use the health assessment form for added information about health history.
11. Aside from mining, do you have any other alternative income that helps your family? If yes, what it is?	
12. Do you participate in any women association's activities in your community? If yes, what type of activities?	

ACTIVITY 4: CHECK WITH YOUR LOCAL HEALTH PROVIDERS AND GET STATISTICS ON INCIDENCE OF MERCURY POISONING AND HOW THIS IS BEING MANAGED

At best, local hospitals and clinics are your best sources of information. Ask your local doctors and health care workers about this and see how much they know about this issue. Whatever information you will gather will help us come up with a much more 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 . That's the game plan.

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

1. Updated report on the incidence of acute mercury poisoning in the local area

2. Known how local health care providers manage mercury poisoning
3. Knows how much they know about the issue, and the things they need to better grasp it and manage it
4. Shared and discussed ways of monitoring and managing mercury poisoning in the community

PROCESS:

Visit a nearest health centre and ask for a three-year record of morbidity and mortality in the community from your health workers. The health records indicate illnesses that can be linked to mercury symptoms as stated in Part 1.3.

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? <u>What are your observations of them?</u>	
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 BALLMILL STATIONS IN YOUR NEIGHBORHOOD

The thing is, the answers maybe just around you and you don't have to go too far to start finding out. Like a detective on the move, start going around your neighborhood and observe their methods of recovering gold. And 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 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. Can you now spot/identify and describe what are the other equipment, machines and materials used by small-scale miners in their respective mining facility that is/are not listed in the Gravity Concentration Method table?

Ask them to tell a story about their involvement in ASGM, their personal opinions about the industry, and their method used in extracting gold. In this way, miner can share their views about mercury, its effects (good or bad), its economic gain (low or high) and involvement of the family in sustaining family's 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 checklist of the common signs and symptoms of mercury poisoning
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 your family do? 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, make sure that you blend well with the crowd and the conditions in the community. For example, wearing sunglasses and slinging expensive looking cameras and other gadgets will probably not help you do this task successfully.



Process:


BAN Toxics developed an initial collection of site indicators during its

several visits in 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. Handy 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 in doing 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 for cooking of concentrates. 	The amalgam is burned in a basic fume hood where mercury is lost, leaving behind the gold. Be aware of the smell of a burning metal. It's a sign of a recent smelting activity.
Balatoc, Pasil	3. Elemental mercury (photo of mercury found in the facility during the MeMo in Balatoc)	Mercury is used by small-scale miners to concentrate gold in the form of amalgam.

<p>Magdiwang, Romblon</p>	<p>4. Use of Wooden pan</p> 	<p>A wooden pan is used to separate gold concentrate from ore concentrate. According to Leoncio Naoy, a miner from Benguet, miners prefer using wooden pan because it is naturally buoyant, making it easier to hold in 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.</p> <p>Disclaimer: This indicator may only be used to detect mercury use in Romblon and not in other ASGM areas.</p>
	<p>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.</p>	<p>1. Ask to see the metal / steel pan. The location of the metal/steel pan is an immediate indicator if it is being used or not. Usually miners who are actively using metal pans would place these close to the area of work. If the pans are further from their work area, this means that the pans are not often used. If they are not, the miners are probably using mercury.</p> <p>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.</p>
	<p>6. Look at the shape of the sluice boxes. Are they short? Do the miners have means of controlling water flow on the sluice box?</p>	<p>Short sluice boxes indicate that a miner is using mercury as there is little concern over effective gravity concentration.</p> <p>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 of effective sluicing and would not pay attention to controlling water flow on the sluice.</p>
	<p>7. How much water does the operation use while sluicing?</p>	<p>Gravity concentration depends on good water supply and flow. Miners who do not pay attention to their water supply indicate the use of mercury.</p>

	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 skill to collect the gold.
	9. Look at other practices of recovering gold and be able to tell whether they are using mercury or not in mercury in the process.	No mercury: use of detergent soap and magnets With mercury: use of local fruit lime/ calamansi and ice cubes

C. Mercury in the environment -- Anecdotal evidences

Mercury circulates in the environment. With increasing temperature it evaporates, but when it rains, it comes back again. It can be found in the plants, sediments and water bodies.

As we 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 a representative of the reality and the higher the chances of this being true.

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

Look for other instances like these and cite them.

Anecdotes
Romblon: 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 lack of vegetation. In areas where mercury is not being used, they say cows are healthier because the grasses are greener and more abundant.
In Diwalwal, 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 Mines in Kalinga, miners recover bits and pieces of mercury from their tin roof by scrubbing over ice cubes and sponge.

RECORDING AND SUMMARISING YOUR FINDINGS

In this phase, data collected

in the field are transformed into credible evidences 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 excel or any database application.

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.

BOX 2:

SOME TIPS FOR CONDUCTING YOUR MONITORING

Be transparent to 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 understand the sequence of the activities, and more importantly, the relevance of these 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. Very often, they can take over a lead responsibility for the monitoring. This will standardize the data and ensure their reliability. It is recommendable then to choose at least two members of the group or community as key contact partners and informants. This will enable us to come up with objective information and to reduce 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 into 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 RESPONSE

Based on the monitoring results, stakeholders can decide on 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 should 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 community¹¹.

Effective planning addresses the question -- 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. This collective action forms in many ways such as writing a simple letter or petition, a street protests and hunger strikes.

Nowadays, the social media becomes the hub for people to air out opinions and organize people to do something.

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 they will help achieve the results that you want to push for.

There are simple and effective ways of planning your campaigns and the lack of funds should not be a major hindrance. Collectively and as an individual, 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.

¹¹ Retrieved from <http://ctb.ku.edu/en/table-of-contents/structure/strategic-planning/develop-action-plans/main>.

There are 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 is most feasible for you.
4. Determine your targets – map out the people and policy makers that will help institute the change.
5. Implement your plan - this is where you execute your plan through engaging the 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 the plan. Always remember -- not fully achieving your objectives doesn't mean you have failed completely. In most instances, it provides you with valuable inputs in redefining strategies and leads you closer to achieving your objectives.

ACTIVITY: 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:

TARGETS/NAMES	NOTES
Champions	
Allies	
Undecided	
Opponents	
Big Opponents	

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.

CONTACT BAN TOXICS FOR SUPPORT!

At the end of this activity, remember that you're not alone and that we're in this together.

Here's a link to tools and information that can help you in your community monitoring:

The following tools and information materials are contained in a CD and can be found in our website – www.bantoxics.org.

- Mercury Primer
- Deciphering Benguet Method : A manual for ASGM miners
- 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 : National Strategic Plan for the Phase-out of Mercury in the Philippines; The Price of Gold; Mercury Trade in the Philippines; 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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ANNEXES

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 _____) | |

INDIVIDUAL HEALTH ASSESSMENT FORM

IMPORTANT:

This health assessment form can be used with other activities contained in the handbook. The group may undergo specific training or certain medical background maybe needed to administer this questionnaire more effectively.

If you don't have medical background and find this too complicated. Ask Ban Toxics for assistance.

History and Health Related QUESTIONNAIRE

BILANG:
 PETA NG PANAYAM: / /
 Mm dd yy

PANGALAN: _____
 KAPANGANAKAN:

Petsa: / /
 Mm dd yy

Saan ipinanganak? _____

EDAD: _____ years _____ months
 KASARIAN: Babae Lalaki

TIRAHAN _____

Layo ng tirahan mula sa A) ball mill B) minahan C) torching station

<1 km < 1-3 kms 3.1-5 km 5km

TAON NG PANINIRAHAN SA KASALUKULANG TIRAHAN:

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

ANTAS/GRADO huling napasukan:

Wala kinder Grade 6 Graduate High School Graduate
 College Graduate Iba pa _____

TRABAHO NG PASYENTE

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:	_____	_____	_____

TRABAHO NG PASYENTE

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:

Naninigarilyo?

Kung Oo, anong edad nagsimula

Kung Oo, ilang sigarilyo sa isang araw?

PASYENTE

Oo Hindi

ASAWA

Oo Hindi

PAG INOM NG ALAK:		PASYENTE	ASAWA
Umiinom ng alak?		<input type="checkbox"/> Oo <input type="checkbox"/> Hindi	<input type="checkbox"/> Oo <input type="checkbox"/> Hindi
Kung Oo, gaano kadalas?		_____	_____
Kung Oo, anong klase ng inuming Alak?		_____	_____
Dami ng iniinom (bote) sa bawat pag-inom		_____	_____

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? PANLUTO? PANLIGO?

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: _____

NALILIGO KA BA SA ILOG? Oo Hindi

HEALTH HISTORY

Past History	Family History (Specify member)
<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"/> _____
<input type="checkbox"/> Allergies _____	<input type="checkbox"/> _____
(specify _____)	
<input type="checkbox"/> Cancers _____	<input type="checkbox"/> _____
(specify _____)	

GENERAL GUIDELINES IN CONDUCTING INTERVIEW AND FOCUS GROUPS

INTERVIEW INTRODUCTION¹

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

INTRODUCTIONS

Your name and the other team facilitators.

PURPOSE OF 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 icebreaker can be inserted to increase comfort and level the playing field. Example: "If you win 20 Million in the Lotto, what would you do with the money?"

ADDED 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 helpful probes include:

¹ How to Conduct Focus Groups by Elliot and Associate, 2005. Retrieved from https://assessment.trinity.duke.edu/documents/How_to_Conduct_a_Focus_Group.pdf

- “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:

- Self-appointed experts: “Thank you. What do other people think?”
- The dominator: “Let’s have some other comments.”
- The rambler: Stop eye contact; look at your watch; jump in at their inhale.
- The shy participant: Make eye contact; call on them; smile at them. 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 interviews 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:
 - COMPILER
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.

- One column for coding :
 - One column for the participant
 - 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.

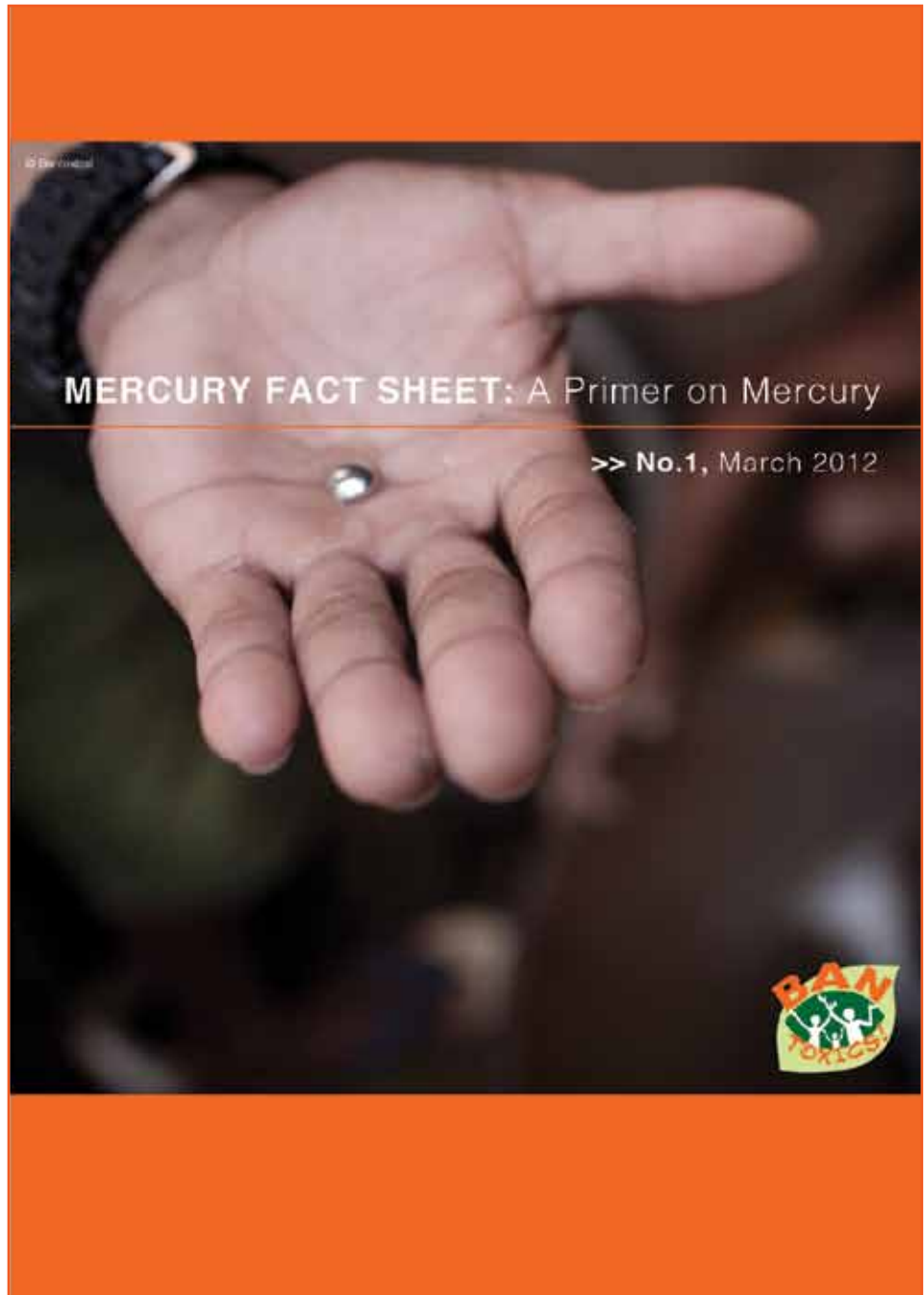
ANALYZE

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.

SYNTHESIZE

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 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.

MERCURY AND
ASGM PRIMER



What is Mercury?

Mercury, or in Tagalog "asoge", occurs naturally in the environment and exists in a large number of forms. Mercury is a constituent 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?

a) 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.

b) 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.

c) 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?

a) 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.

b) 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 on-set of the industrial age. Mercury is now present in various environmental media and food.

c) 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.

MERCURY: A Primer

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), soaps 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 300,000 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 to aquatic life even at low concentrations. The amount of mercury in one thermometer, 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, 2008, 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.



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.



¹http://www.searato.gov.ph/press_release/20CR0111_anguni2.asp. Note that some studies peg the amount of mercury release from small-scale gold mining up to 20 grams emitted per 1 gram of gold retrieved.

²<http://www.epa.gov/po/hemericals/DACF%2097-98.pdf>

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PROPER HANDLING OF MERCURY AND MERCURY CONTAINING EQUIPMENT AND PRODUCTS

OPTIONS FOR MANAGEMENT OF MERCURY WASTE IN THE ARTISANAL AND SMALL-SCALE GOLD MINING COMMUNITIES (ASGM)

What You Should Do If You Have Elemental Mercury in Your Home?¹

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.
- Kitty litter or oil absorbent should be placed around the product to protect it from breaking or sudden shocks.
- Clearly label storage container as “Mercury-DO NOT OPEN.”
- Transport containers to a household hazardous waste collection in cardboard box and secure so that they do not tip over and to minimize shifting or sliding during sudden stops or turns.
- Transport in the back of a pickup truck or in a car trunk. If you must transport in the passenger compartment, make sure there is adequate ventilation.

¹ Handling Options for Mercury-Containing Products in the Home <http://www.epa.illinois.gov/topics/waste-management/waste-disposal/household-hazardous-waste/mercury/index>

² Management and Storage of Mercury Waste http://www.who.int/water_sanitation_health/healthcare_waste/module20.pdf



Options for Managing A Mercury Spill²

* Applies to Health Care Facilities, Homes and Schools

Personal protective equipment (PPE) needed to clean a spill:

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



Other things needed to clean a spill:

- 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



Other things needed to clean a spill: 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



Other things needed to clean a spill: 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

**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 air-tight 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

REFERENCE

Management and Storage of Mercury Waste http://www.who.int/water_sanitation_health/healthcare_waste/module20.pdf

Handling Options for Mercury-Containing Products in the Home
<http://www.epa.illinois.gov/topics/waste-management/waste-disposal/household-hazardous-waste/mercury/index>