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**Intergovernmental negotiating committee  
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on mercury  
Seventh session**

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Item 3 (d) of the provisional agenda\*

**Work to prepare for the entry into force of the Minamata  
Convention on Mercury and for the first meeting of the  
Conference of the Parties to the Convention: activities to  
facilitate the rapid entry into force of the Convention and  
its effective implementation upon entry into force**

**Draft guidance on developing a national action plan to reduce  
and, where feasible, eliminate mercury use in artisanal and  
small-scale gold mining**

**Note by the secretariat**

1. By paragraph 3 (a) of article 7, the Minamata Convention on Mercury provides that each party that has notified the secretariat that artisanal and small-scale gold mining and processing in its territory are more than insignificant shall develop and implement a national action plan in accordance with annex C to the Convention.
2. Activities aimed at addressing major concerns relating to artisanal and small-scale gold mining have been under way for many years, led initially by the United Nations Industrial Development Organization, the current co-lead of the relevant partnership area under the United Nations Environment Programme (UNEP) Global Mercury Partnership. These activities have included the development of guidance for countries in taking action on artisanal and small-scale gold mining.
3. In paragraph 8 of its resolution on arrangements in the interim period (UNEP(DTIE)/Hg/CONF/4, annex I), the Conference of Plenipotentiaries requested the intergovernmental negotiating committee to support, as practicable and consistent with the priorities in the Convention, those activities required or encouraged by the Convention that will facilitate the rapid entry into force of the Convention and its effective implementation upon entry into force, including in particular guidance and assistance to countries with artisanal and small-scale gold mining in developing their national action plans.
4. At its sixth session, the committee decided that the guidance developed under the UNEP Global Mercury Partnership should serve as the basis for the preparation of guidance on the development of national action plans on artisanal and small-scale gold mining, and requested the secretariat, in cooperation with the artisanal and small-scale gold mining partnership area and the World Health Organization, to revise that guidance as required to address all areas set out in annex C to the Convention, for further consideration by the committee at its seventh session. The guidance is set out in the annex to the present note, without formal editing.

\* UNEP(DTIE)/Hg/INC.7/1.

5. The committee may wish to further consider the draft guidance and recommend its use by countries in the preparation of their national action plans on artisanal and small-scale gold mining.

# GUIDANCE DOCUMENT



## **Developing a National Action Plan to Reduce, and Where Feasible, Eliminate Mercury Use in Artisanal and Small Scale Gold Mining**

Working Draft  
August 17, 2015



## Foreword

The Minamata Convention on Mercury, opened for signature in October 2013 in Japan, creates a blueprint for actions to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. Article 7 of the Minamata Convention addresses the largest anthropogenic source of mercury pollution, artisanal and small scale gold mining (ASGM). Under Article 7, countries where mercury is used in ASGM are required to take steps to reduce and, where feasible, eliminate the use of mercury. Because the ASGM sector is closely tied to complex economic development and poverty issues, the Convention allows flexible, country-specific solutions through the development of an ASGM National Action Plan (NAP). Although each country's NAP process will be unique, Annex C of the Minamata Convention provides a list of elements that must be included in each NAP.

This document represents an expansion of the UNEP's *Guidance Document: Developing a National Strategic Plan to Reduce Mercury Use in Artisanal and Small Scale Gold Mining* (UNEP 2011), and is intended to reflect Convention obligation and other advances in understanding of the ASGM sector. This document provides guidance to countries in formulating NAPs that are compliant with the requirements of the Minamata Convention, and provides technical, legal and policy information on issues related to ASGM, which can be useful when preparing and implementing the NAP. Although the use of this guidance is not a requirement under the Minamata Convention, this guidance is intended to assist countries with the preparation of their NAPs.

The document has been drafted by members of UNEP's Global Mercury Partnership, ASGM Partnership Area.

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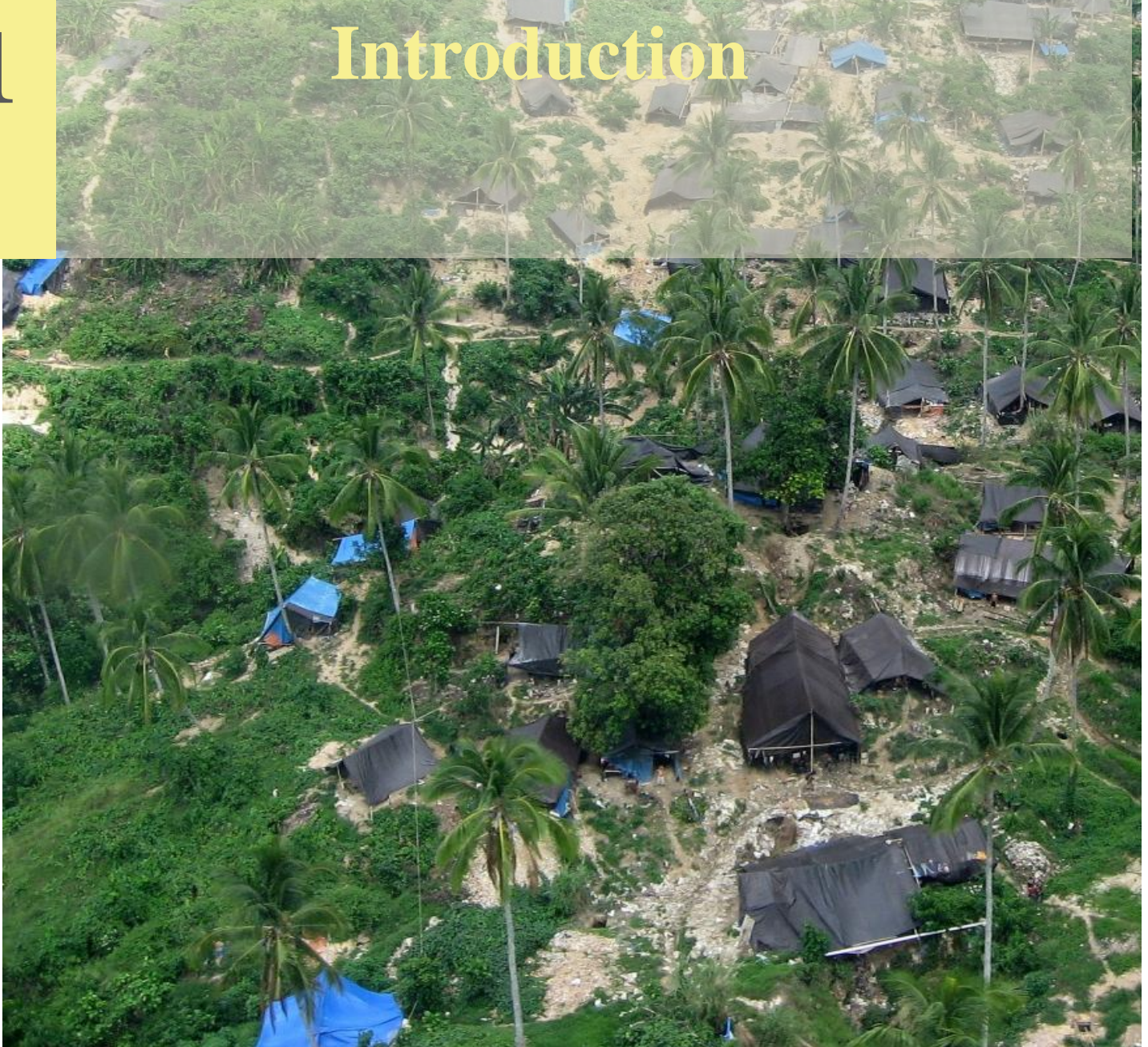
## Abbreviations and Acronyms

<b>ASGM</b>	Artisanal and Small-scale Gold Mining
<b>Au</b>	Gold
<b>COMTRADE</b>	United Nations Statistical Division – Commercial Trade
<b>Convention</b>	Minamata Convention on Mercury
<b>COP</b>	Conference of the Parties
<b>EMP</b>	Environmental Management Plan
<b>EIA</b>	Environmental Impact Assessment
<b>GEF</b>	Global Environmental Facility
<b>Hg</b>	Mercury
<b>INC</b>	Intergovernmental Negotiating Committee on Mercury
<b>INF</b>	Information document
<b>INTERPOL</b>	International Criminal Police Organization
<b>NAP</b>	National Action Plan
<b>NGO</b>	Non-Governmental Organization
<b>OECD</b>	Organization for Economic Cooperation and Development
<b>SRI</b>	Socially Responsible Investment
<b>USEPA</b>	United States Environmental Protection Agency
<b>UNEP</b>	United Nations Environment Programme
<b>UNIDO</b>	United Nations Industrial Development Organization
<b>WHO</b>	World Health Organization
<b>WOA</b>	Whole ore amalgamation



1

# Introduction



## 1. Introduction

### 1.1 The Minamata Convention on Mercury

The Minamata Convention on Mercury is a global agreement to protect human health and the environment from the adverse effects of mercury. The text of the Convention was agreed in January 2013, and the Convention was opened for signature in October 2013.

The Convention addresses mercury, a globally ubiquitous and naturally occurring metal that has broad uses in everyday objects and industrial processes. Mercury is released to the atmosphere, soil and water from a variety of sources. Reducing and eliminating anthropogenic sources of mercury throughout its lifecycle has been a key factor in shaping the obligations under the Convention. As a result, the Convention includes, in part, measures to control the supply and trade of mercury, phase-outs of certain products and processes that use mercury, control measures for air, land and water emissions and releases, waste management requirements, actions to address contaminated sites, and steps to reduce, and where feasible eliminate, mercury use in artisanal and small-scale gold mining. Health aspects are addressed in a stand-alone article (Article 16) to emphasize the importance of the impact of mercury from various sectors to human health, as well as in other articles where specific engagement with the health sector is needed. The Convention also includes measures for technical exchange and international support.

### 1.2 About this document

The United Nations Environment Program (UNEP) first developed a guidance document on artisanal and small scale gold mining (ASGM) in 2011, entitled *Guidance Document: Developing a National Strategic Plan to Reduce Mercury Use in Artisanal and Small Scale Gold Mining* (UNEP 2011). The document was prepared to assist governments with the development of national strategic plans to improve practices and working conditions in ASGM communities and to reduce mercury, and where feasible eliminate, use, emissions and releases from the sector. The development of National Strategic Plans was pilot-tested in the Philippines and Cambodia and the 2011 guidance document reflects the experiences in those countries<sup>1</sup>.

This document represents an expansion of this original guidance document and is intended to reflect the language of the Convention and other advances in understanding of the ASGM sector. It is intended to provide guidance to countries in formulating ASGM National Action Plans (NAPs) that

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<sup>1</sup> The completed National Strategic Plan from the Philippines can be found at the UNEP website (<http://www.unep.org/chemicalsandwaste/Portals/9/2011-06-03%20NSP-ASGM.FINAL.2011.pdf>). While the National Strategic Plan from the Philippines does not reflect all of the requirements outlined under the Minamata Convention on Mercury, it may serve as a useful example to countries developing NAPs.

are compliant with the requirements of the Minamata Convention. The document also provides technical, legal and policy information on issues related to ASGM, which may be useful when preparing and implementing the NAP. This guidance is indicative – the use of this document is not mandatory or a requirement under the Convention.

The mandate for the development of this document comes from the Final Act of the Minamata Convention, which called on the Intergovernmental Negotiating Committee on Mercury (INC) to support the development of guidance to countries in preparing their NAPs.

A proposal for the development of a guidance document based on UNEP's 2011 document was presented at the INC's 6<sup>th</sup> meeting. The proposal was accepted by the INC as a basis for the development of this guidance document for consideration at the INC's 7<sup>th</sup> meeting.

The initial draft guidance document was circulated to members of the UNEP Global Mercury Partnership and INC focal points for comment. Inputs were also provided by the World Health Organization on relevant health aspects. This current draft reflects consideration of the comments received on the initial draft. The guidance document may be further revised at the request of the INC.

The document has been developed by members of the UNEP Global Mercury Partnership, ASGM Partnership Area with financial support from UNEP and the U.S. Environmental Protection Agency (USEPA). The document was drafted by the Natural Resources Defense Council and the Biodiversity Research Institute, with significant contributions from an international panel of experts from the Artisanal Gold Council, the United Nations Industrial Development Organization (UNIDO), UNEP, Cordy Geosciences, U.S. State Department, USEPA, and BanToxics.

### **1.3 Structure and use of this document**

Chapter 1 of this document provides basic background information on the development of the guidance document. Chapter 2 provides an overview of the global ASGM sector including a description of mercury use in ASGM. Chapter 3 outlines the obligations under Article 7 of the Minamata Convention, including the National Action Plan (NAP) requirements, and summarizes other Articles in the Convention that are relevant to ASGM. Chapter 4 describes the phases of the NAP development. Chapter 5 provides specific information on each required element of the NAP as outlined in Annex C of the Minamata Convention, while Chapter 6 describes additional strategies that may be included in the NAP. Furthermore, Chapter 7 provides a discussion on gender and labor issues within ASGM. Appendices included at the end of the document provide additional supporting information for developing the NAP.

There is also a reference section containing information on material cited within this document as well as other resources that can be consulted during the NAP process. If governments or stakeholders have specific questions not found in this document or the reference section, they are encouraged to contact UNEP's Chemicals Branch and UNEP's Global Mercury Partnership ASGM Partnership Area.

➡ UNEP's Chemicals Branch

[www.chem.unep.ch](http://www.chem.unep.ch)

➡ UNEP's Global Mercury Partnership ASGM Partnership Area

<http://www.unep.org/chemicalsandwaste/Mercury/InterimActivities/Partnerships/ArtisanalandSmallScaleGoldMining/tabid/3526/language/en-US/Default.aspx>



## 2 Artisanal and Small Scale Gold Mining (ASGM) and Mercury



## 2. Artisanal and Small Scale Gold Mining (ASGM) and Mercury

### 2.1 The ASGM Sector

Artisanal and small-scale gold mining (ASGM) is estimated to be responsible for over 700 tonnes per year of mercury emissions to the atmosphere and an additional 800 tonnes per year of mercury releases to land and water, making it the largest anthropogenic source of mercury (AMAP/UNEP 2013). The Minamata Convention on Mercury defines ASGM as:

“...gold mining conducted by individual miners or small enterprises with limited capital investment and production...”

Article 2(a)

### 2.2 Overview of ASGM and Mercury Use

Mercury is used to extract gold by artisanal and small scale gold miners in many parts of the world. Conditions favoring its use include: affordability relative to the price of gold; ready accessibility; ease of use; and ability to be used in many locations. Mercury use allows miners to produce gold quickly, often in one day.

The use of mercury in ASGM practices normally consists of the following steps:

- ➔ **Step 1. Extraction of material:** Either alluvial deposits (river sediments) or hard-rock deposits (typically gold in quartz veins) are exploited by miners. The type of deposit is important as it dictates the strategy for reducing mercury use.
- ➔ **Step 2. Processing the Ore:** In order to capture gold it must be liberated from other minerals. In hard rock mining this involves crushing and milling. In alluvial mining the gold is generally already liberated in the sediments. Once the gold is liberated, it is typically concentrated into a smaller mass using gravity or other techniques, before amalgamation. However, some operations do not concentrate the ore, and instead apply mercury to a large amount of ore. This highly environmentally destructive process is referred to as whole ore amalgamation (see below).
- ➔ **Step 3 Amalgamation:** Mercury is used to capture the liberated gold particles. It bonds with the gold forming a soft alloy of approximately 50% mercury and 50% gold referred to as an “amalgam”. Amalgam is very heavy and therefore easy to separate from other materials and collect. The two main approaches to amalgamation are:

- **Whole ore amalgamation** occurs when miners add mercury to a large amount of the ore with little prior concentration. This is a mercury intensive process that uses 3 to 50 units of mercury for each unit of gold recovered (Sousa et al. 2010). Most of this mercury is released to the tailings. Whole ore amalgamation is considered a *worst-practice* (see Chapter 5.2) targeted for elimination by Annex C of the Minamata Convention (see Annex 1 of this document).
- **Concentrate amalgamation** occurs when miners reduce the mass of ore through concentration by generally at least 100 times before mercury is applied. In this case the amount of mercury used is much smaller - roughly 1.3 units mercury for each unit of gold produced.

In some sites, the activities of Step 1 to 3 take place in sensitive biodiversity areas, risking the mercury exposure to the environment and some endangered species. In other sites, the ASGM activities take place in the up-stream watershed areas, spreading the mercury pollution further to the downstream areas.

➔ **Step 4 Burning of Amalgam:** After collecting the amalgam, the mercury is separated from the gold by heating. The mercury evaporates, leaving the gold and some impurities behind. Two main approaches are used for burning amalgam:

- **Open burning** occurs when miners apply heat directly to amalgam in the open, emitting all of the mercury to the atmosphere. Open burning, considered a *worst practice* targeted for elimination by Annex C the Minamata Convention, causes maximum exposure to miners, their families and the environment. Exposure can occur immediately during the burn, but can also continue over time as mercury deposited on clothes and surfaces of structures is re-emitted, keeping atmospheric levels high.
- **Burning amalgam with a mercury capture system** occurs when miners burn amalgam inside a vapor capture system such as a retort or mercury capture device. These systems typically capture 75 to 95% of the mercury in the amalgam and reduce some exposure if properly used (UNEP 2012a).

The gold produced by amalgam burning is porous and called “sponge gold.” It typically contains 2-5% residual mercury because of incomplete burning and evaporation of mercury. In extremely inefficient burning, residual mercury concentrations in the sponge gold can be as high as 20% (Veiga and Hinton 2002, UNIDO 2006). This residual mercury can later be emitted when the sponge gold is melted into ingots at gold shops.

When amalgam is burned in residential areas, it causes direct exposure to those living there, even when mercury vapor capture is used, because capture devices do not capture 100% of the mercury. Burning in residential areas is therefore also a *worst practice* and is targeted for elimination.



ASGM practices generally do not capture all of the gold from the ore, and often the tailings (i.e., waste) from the mining process still contains economically viable concentrations of gold. Because of the reasons detailed in step 3 above, the tailings are contaminated with mercury, particularly in the case of whole ore amalgamation but even when concentrate amalgamation is employed. Tailings may be treated with cyanide to capture the residual gold. Cyanide dissolves mercury, and increases its mobility in aquatic ecosystems and also releases it to the atmosphere. This behavior makes cyanide leaching of mercury contaminated materials a *worst practice* targeted for elimination. This situation is also applicable to abandoned tailings. Abandoned tailings are abundant in some regions with long mining histories, and are increasingly being mined due to their residual gold content. Since mercury amalgamation has been in use for centuries, abandoned tailings are likely to be mercury-contaminated.

**“Actions to eliminate:**

- Whole ore amalgamation
- Open burning of amalgam or processed amalgam
- Burning of amalgam in residential areas
- Cyanide leaching in sediment, ore or tailings to which mercury has been added without first removing mercury “

**Annex C, Paragraph1(b)**

# 3 ASGM and the Minamata Convention



### 3. ASGM and the Minamata Convention

#### 3.1 Obligations contained in Article 7 and Annex C of the Minamata Convention

Article 7 of the Minamata Convention on Mercury addresses ASGM in which mercury amalgamation is used (Annex 1). It requires that any country with such ASGM activities within its territory “take steps to reduce, and where feasible eliminate, the use of mercury and mercury compounds in ASGM, and the emissions and releases to the environment of mercury from such mining and processing” (Article 7.2). If the country determines that its ASGM activities are “more than insignificant” (Article 7.3), it must notify the Secretariat, and must develop *and* implement “a national action plan in accordance with Annex C” (Article 7.3(a)).

Annex C outlines the elements of the NAP.

Paragraph 1 of Annex C describes the mandatory elements of the NAP, while Paragraph 2 describes additional elements that countries may include. All elements are

discussed in greater detail in Chapters 5 and 6 of this document. Annex 1 of this document includes a complete copy of Article 7 and Annex C as a reference. In addition, a suggested Table of Contents for the NAP is provided in Annex 2 of this document.

The term “**more than insignificant**” is undefined in the Convention. Criteria or metrics that States might consider to determine whether ASGM activities are “more than insignificant” may include: the number of miners, the number or size of mining sites, and/or the ASGM impacts on public health and the environment. Accordingly, ASGM activities in more than one site in a region, mercury import-export statistics, the amount of mercury used and its trade, the number of miners, e.g. more than 1000, the number or size of mining sites, widespread environmental pollution and environmental damage, and/or the ASGM impacts on public health and the environment, may be relevant factors in making this determination

## 3.2 Other articles/provisions of the Minamata Convention that relate to ASGM

In addition to Article 7 and Annex C, there are other provisions of the Minamata Convention relevant also to ASGM. These include:

- **Article 3: Mercury supply sources and trade.** In Article 3, certain mercury supply sources are restricted from use for ASGM, and an informed consent framework for mercury trade across international borders is established.
- **Article 10: Environmentally sound interim storage of mercury, other than mercury wastes.** Under Article 10, countries must take measures to ensure that storage of mercury for an allowed use under the Convention is undertaken in an environmentally sound manner, taking into account guidelines to be developed by the Conference of Parties (COP).
- **Article 11: Mercury wastes.** Under Article 11, countries must take appropriate measures to ensure mercury wastes are managed in an environmentally sound manner, taking into account guidelines adopted by the Basel Convention and in accordance with requirements to be developed by the COP of the Minamata Convention.
- **Article 12: Contaminated Sites.** Countries shall endeavor to develop strategies for identifying and assessing mercury contaminated sites, and may utilize guidance on managing contaminated sites to be developed by the COP.
- **Article 16: Health Aspects.** Countries are encouraged to promote activities which minimize the mercury exposure of vulnerable populations and the adverse consequences of such exposures.
- **Article 17:** It is also important to note that an information sharing provision under Article 17.5 states “information on the health and safety of humans and the environment shall not be regarded as confidential.”
- **Article 18:** Calls upon Parties to promote and facilitate, within their capabilities, awareness raising activities with the public about: health and environmental effects of mercury and mercury compounds; available alternatives; and related activities being conducted in support of the implementation of the Convention.
- **Article 20: National Implementation Plans.** This Article provides guidance to countries intending to prepare optional National Implementation Plans covering all Convention obligations. Countries may wish to consider incorporating the NAP for ASGM as part of their NIP.
- **Article 21: Reporting.** At its first meeting, the COP will decide on the timing and format for reporting obligations for Parties under the Convention, including reporting obligations related to ASGM under Article 7 and mercury trade under Article 3.

### 3.3 Submission of the NAP and Reporting Requirements

Under Article 7, after developing its NAP, a country must “submit its national action plan to the Secretariat no later than three years after entry into force of the Convention for it or three years after the notification to the Secretariat, whichever is later”<sup>2</sup>. Thereafter, a party must submit a review of progress in meeting its obligations under Article 7 every 3 years. These reviews are to be in reports submitted under Article 21 of the Convention.

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<sup>2</sup> The Convention will enter into force 90 days after the 50<sup>th</sup> country has deposited its instruments of ratification, acceptance, approval, or accession.



# 4

## Steps for Developing a National Action Plan

## 4. Steps for Developing a National Action Plan

Countries may wish to follow a process involving six major steps to develop (and later, review and update) a NAP:

- ➔ 1. Establishing a coordinating mechanism and organization process;
- ➔ 2. Developing a national overview of the ASGM sector, including baseline estimates of mercury use and practices developed as part of the mercury inventory activity;
- ➔ 3. Setting goals, national objectives and mercury reduction targets, including elimination of mercury use in ASGM where feasible;
- ➔ 4. Formulating an implementation strategy;
- ➔ 5. Developing an evaluation process for the NAP; and
- ➔ 6. Endorsing and submitting the NAP.

Some of these steps can be conducted simultaneously, allowing for a more iterative and adaptive process for developing the NAP. The NAP provides the opportunity to outline a clear and transparent basis for the support, development, and implementation of activities to reduce, and where feasible eliminate, mercury use, emissions and releases from ASGM at the national level. In addition to the obligations outlined in the Minamata Convention, countries may also choose to incorporate into their NAPs other economic, social, environmental, and legal aspects that affect the ASGM sector within the context of sustainable development at the local, national and regional scale (for example, see Chapter 7 for a discussion on gender and labor issues within ASGM).

### 4.1 Establishing a Coordinating Mechanism and Organization Process

In the absence of a pre-existing institution to perform this role, countries may consider the formation of an executing body, or working group, that will guide the NAP development through all its phases and ensure that there is proper project planning and management throughout the process. The working group should include members from different governmental ministries or departments, including local government representatives, and interact with other relevant agencies as appropriate. It may also include relevant members of civil society with experience and knowledge in the ASGM sector, including representatives of artisanal and small scale mining groups and community organizations. This will ensure that all aspects of ASGM are considered during the

development of the NAP as well as cohesion of the NAP with activities or programs of other ministries or departments. The relative roles and responsibilities of the members of the working group should be clearly defined from the outset.

In addition, the working group should regularly interact with stakeholders. In order to do so, the working group may consider it useful to organize a stakeholder advisory group, composed of stakeholders who possess relevant knowledge and information, and whose collaboration and cooperation will be needed for the successful formulation and implementation of the NAP. The plan, although written at a national level, should also integrate the local needs and circumstances, and should therefore be developed in consultation with stakeholders and partners at the national, regional, and local levels. The working group should interact with stakeholders and/or engage with the advisory group at regular intervals and during all phases of NAP development and a clear mechanism should be established for stakeholders to provide direct feedback on the NAP during its development and implementation.

**Table 4-1: Entities to be considered as members of or to interact with the NAP Working Group**

Ministries/Entities	Responsibilities / Areas of Expertise
Environment	<ul style="list-style-type: none"> <li>• Environmental laws, issues, and regulations</li> <li>• Environmental impacts</li> <li>• Promoting alternatives to mercury in ASGM</li> </ul>
Mining	<ul style="list-style-type: none"> <li>• Statistics and data on ASGM</li> <li>• Mining sector laws and regulations (including formalization of ASGM)</li> <li>• Geological surveys</li> </ul>
Finance	<ul style="list-style-type: none"> <li>• Economic importance of ASGM</li> <li>• Formalization of ASGM sector, including regulation of gold purchases from ASGM miners</li> <li>• Market-based mechanisms for reducing mercury use</li> <li>• Funding for NAP process</li> </ul>
Public Health	<ul style="list-style-type: none"> <li>• Identification of impacts of ASGM on health of miners, ASGM communities, and vulnerable population groups</li> <li>• Public health strategies related to ASGM and integration of such strategies into wider health sector programming</li> <li>• Health promotion, advocacy and awareness raising activities including in communities</li> <li>• Detecting, monitoring and managing mercury intoxication among affected populations</li> </ul>



Ministries/Entities	Responsibilities / Areas of Expertise
Education	<ul style="list-style-type: none"> <li>• Strategies for community outreach and stakeholder involvement</li> </ul>
Trade and Commerce	<ul style="list-style-type: none"> <li>• Mercury trade</li> <li>• Formalization</li> <li>• Market-based mechanisms for reducing mercury use</li> </ul>
Labor	<ul style="list-style-type: none"> <li>• Formalization of ASGM sector</li> <li>• Labor standards, regulations and enforcement, including strategies to eliminate child labor</li> <li>• Occupational safety</li> </ul>
Law Enforcement	<ul style="list-style-type: none"> <li>• Drafting enforcement protocols and regulations for implementation, including customs</li> </ul>
Planning authorities on national and rural development	<ul style="list-style-type: none"> <li>• Reach out to local governments</li> <li>• Sustainable development coordination plan and implementation</li> </ul>
Miners associations, unions, organizations, and representatives	<ul style="list-style-type: none"> <li>• Provide miner's view of current practices and political, economic, legal and social barriers to change</li> <li>• Formalization of ASGM sector</li> <li>• Reach out to miners</li> <li>• Provide insight into legal and illegal mercury trade, gold market dynamics, and barriers to formalization</li> </ul>

**Table 4-2: Stakeholders to be considered as members of the advisory group, in accordance with national circumstances**

ASGM Stakeholder Groups	Contribution to Development of NAP
Gold processors	<ul style="list-style-type: none"> <li>• Have a significant role in mercury exposure/reduction strategies and technological interventions, etc.</li> </ul>
Community leaders and local government from ASGM areas	<ul style="list-style-type: none"> <li>• Assist with development and implementation of plan within ASGM communities</li> </ul>
Indigenous groups	<ul style="list-style-type: none"> <li>• Represent indigenous interests from ASGM operations in indigenous people’s territories</li> </ul>
Technical experts in gold mining	<ul style="list-style-type: none"> <li>• Provides understanding of technical alternatives to mercury use</li> <li>• Provide training opportunities</li> </ul>
Technical experts in mining safety	<ul style="list-style-type: none"> <li>• Consideration of mine safety, soil stabilization, sediment erosion control and trenching and shoring safety</li> </ul>
Environmental and human health organizations	<ul style="list-style-type: none"> <li>• Represent public interests in reducing environmental impacts of ASGM and the risks of exposure to the public</li> </ul>
Human rights group in the form of the Human Rights Commission or a human rights advocacy group	<ul style="list-style-type: none"> <li>• Monitor actions from the perspective of human rights issues with regard to health, women and children rights, etc.</li> </ul>
Academic and research organizations	<ul style="list-style-type: none"> <li>• Provide valuable information and conduct future research, including on effectiveness of measures taken to reduce or eliminate mercury use in ASGM</li> <li>• Provide training opportunities from ASGM specialists</li> <li>• Research and development of mercury-free methods</li> </ul>
Legal professionals	<ul style="list-style-type: none"> <li>• Understand national legislation as it relates to ASGM including relevant regulation on mercury use and trade regulation</li> </ul>

ASGM Stakeholder Groups	Contribution to Development of NAP
Representatives from large scale mining	<ul style="list-style-type: none"> <li>Contribute to finding innovative solutions and provide insights on mining regulatory issues; potential partner with small scale miners on technical improvements to mining practice</li> </ul>
Other relevant land holders	<ul style="list-style-type: none"> <li>Represent interest in land conflicts and in reclaiming impacted lands; risk of mercury exposure</li> </ul>
Police and Customs officials	<ul style="list-style-type: none"> <li>Understand role of enforcement</li> </ul>
Gold buying agents, gold traders, mercury traders	<ul style="list-style-type: none"> <li>Provide insight into market dynamics, and barriers to formalization</li> <li>Important focal point for community health and emissions</li> </ul>
Waste management specialists	<ul style="list-style-type: none"> <li>Provide insight into available mechanisms to handle mercury wastes generated by ASGM and how to clean/restore contaminated sites</li> </ul>
Private sector partner (e.g., large-scale mining company or equipment provider) Financial/banking sector	<ul style="list-style-type: none"> <li>Technical capacity</li> <li>Potential public/private partnership</li> <li>Small and commercial-sized loans to miners to assist with financing transition towards better practices</li> </ul>
Development organizations, including international NGOs, UN agencies, and bilateral aid agencies	<ul style="list-style-type: none"> <li>May provide assistance with health, safety, environmental, business development or other aspects.</li> </ul>
Media and communication groups	<ul style="list-style-type: none"> <li>Can bring in effective communication strategies and approaches at advisory level</li> </ul>
Women's interest groups	<ul style="list-style-type: none"> <li>Issues unique to women miners</li> <li>Specific impact of mercury on women and children</li> </ul>

## 4.2 Developing a National Overview

The formulation of the NAP should be based on Convention obligations and current technical and scientific understanding of the ASGM sector, the use of mercury and processing of gold amalgam, including its health and environmental effects, as well as social and economic analysis of the ASGM sector<sup>3</sup>. To this end, the working group should strive to create a national overview of the ASGM sector that is as comprehensive as possible, including information on:

- Legal and regulatory status of ASGM;
- Structure of the ASGM sector (i.e., single family miners, community mines, etc.);
- Policies surrounding ASGM;
- Geographic distribution of ASGM, including potential future areas of exploitation;
- Economics, such as earnings per capita, mercury supply, use and demand, information on gold trade and export, cost of living, access to finance for miners, social welfare options for miners and their communities;
- Size of the formal and informal ASGM economy;
- Information on mining practices, including information on ore bodies exploited, processes used, the amount of mercury used, the number of people directly involved in ASGM and indirectly exposed to mercury (disaggregated by gender and age);
- Information on the location and demographics of ASGM miners that operate without the use of mercury and the techniques that they use;
- Information on gold processing practices/burn off of mercury in gold processing shops or community retorts;
- Known information on mercury level of the environmental media (as a baseline data), overall environmental impacts, contaminated sites, mercury releases in soil, air and water, including distribution relative to population centers;
- Studies and other information on mercury exposure, through various media, and studies on impacts in ASGM communities and downstream communities;
- Information about access to basic education, health care and other services in mining communities;

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<sup>3</sup> While the focus of the NAP is on ASGM practices within a country's territory, it may be helpful to also consider the influence of ASGM practices and policies in neighboring countries.

- Information about access to technical assistance for miners;
- Leadership and organization of ASGM at national and local levels;
- Experiences in addressing ASGM;
- Information gaps and perception of information at the local and national scale that can be addressed

Annex 3 provides a list of initial questions for consideration in the data collection process for the national overview. A key component of the national overview is the baseline inventory of mercury use and practices in the ASGM sector, as required by Annex C, Paragraph 1(d) of the Convention. Chapter 5.4 of this document provides more detailed information on approaches to conducting baseline inventories of mercury use and mining practices, including descriptions of specific mining practices, estimates for the amount of mercury used per unit gold produced based on practices employed, information on gold processing techniques both in the community and in gold shops, as well as pertinent socio-economic and environmental issues to be considered. This section should provide a balanced overview of the positive impact of ASGM in the country as well as its negative impact.

The information collected for the national overview will be useful for identifying actions that need to be taken within the sector and for the future evaluation of the effectiveness of the NAP. The process of developing the national overview should be viewed as iterative and will depend on the existing knowledge base and relationship with miners and other relevant stakeholders. The process of developing the national overview can begin with a compilation of existing studies, anecdotal information and input from stakeholders and ministry experience to reflect the current state of knowledge. The national overview can then be augmented as more information becomes available. Strategies on how to gather the information will vary from country to country and will need to be adapted to national and local conditions. Members of the working group should be given the task of providing relevant information related to their area of expertise or authority, and from standard sources of data, such as trade and labor statistics. However, in many cases, officially available data will not provide the full range of information needed to understand all aspects of the sector, especially where the sector is informal and/or illegal. Therefore, data will need to be collected directly from the communities where ASGM is practiced. As information is collected and incorporated into the national overview, the working group should also identify major information gaps (and perceptions of information) about the sector that should be filled. The working group should work closely with the stakeholder advisory group and other regional cultural authorities to provide existing information and to develop a strategy on how to fill information gaps.

Once the information has been collected and analyzed, the national overview will provide the basis for identifying national objectives and setting targets for the NAP.

### 4.3 Setting Goals and Objectives

Annex C Paragraph 1(a) requires that countries set national objectives and reduction targets for NAPs. This step is critical in establishing a common understanding among all stakeholders of the purpose and expected outcomes of the NAP implementation. Having clear objectives will also allow a country to evaluate the success of its NAP in the future.

**To set national objectives and reduction targets, countries may consider the following steps:**

- ➡ 1. Establish a problem statement;
- ➡ 2. Establish a goal; and
- ➡ 3. Establish national objectives and reduction targets, with elimination as a goal where feasible.

In order to be effective, the objectives should be quantitative and time-bound where possible. Chapter 5.1 of this document describes these steps in more detail and provides examples of a problem statement, goals, objectives and reduction targets.

**When establishing goals and objectives, countries could consider:**

- How does mercury enter the country and get to ASGM sites? What are the legal permits to import and trade mercury in the country?
- Monitoring the potential for primary mercury (artisanal) to emerge as more countries seek to ban import and export of elementary mercury.
- Whether techniques, such as whole ore amalgamation, would drastically impact mercury use if they are eliminated? In this case, ambitious objectives and targets to reduce mercury use and release would be appropriate.
- If whole ore amalgamation is eliminated or minimized, how much mercury would the sector require annually over the next 5-10 years as low-mercury and mercury-free techniques are phased in?
- How widespread is burning the amalgam in residential areas and burning the amalgam in the open areas? What targets can be set with regards to these worst practices?
- If mercury capture when burning amalgam is implemented, how much mercury is recycled for reuse?
- How consistent is mercury use in ASGM across the country? If there are large differences between regions, should objectives and targets be set regionally?
- Are some ASGM regions significantly more remote than others? Should this be reflected in the timeline for mercury reduction goals for these regions?
- Are some communities or population groups particularly impacted or at risk of being impacted by ASGM related activities ?
- Are there other factors (e.g., intensive deforestation, conflict with protected areas, land use conflicts with farmers, rising unemployment) that would make interventions a priority and what could affect the timeline for interventions?

The baseline inventory described in Chapter 4.2, and elaborated in Chapter 5.4, is particularly critical for informing the development of specific national objectives and reduction targets. Information on the amounts of mercury used, the prevalent mining and processing techniques being used, the regions of the country with the heaviest use, and information about potentially affected populations, will allow the working group to evaluate what targets might be reasonably achievable to reduce mercury use and release.

The national objectives and reduction targets should be periodically revisited over the course of the NAP implementation, and updated as appropriate.

## 4.4 Formulating an Implementation Strategy

The country implementation strategy is an important part of the NAP. It will establish the foundation for subsequent work and clarify the responsibilities of national agencies and other partners and stakeholders. Critically, the working group should clearly identify the appropriate authorities responsible for implementation of each aspect of the plan.

When first developing options to include in the implementation strategy, there are a number of questions the working group may want to consider, ensuring that the selected strategies are effective, targeted, and integrated with broader government priorities:

- What are the most successful strategies to reduce or eliminate mercury use in ASGM that have been implemented to date in your country? What made them successful? How were they funded? What are the lessons learned?
- What lessons can be learned from initiatives in other countries?
- What are the most successful strategies to reduce or eliminate mercury emissions and losses and to enhance mercury capture that have been implemented to-date? Are there other activities related to ASGM currently on-going or planned for in the country, which may be leveraged by the NAP?
- What other initiatives are ongoing in related sectors (such as public health, trade, overall chemicals management, watershed management, biodiversity conservation), that could be linked to activities in the NAP?
- Should implementation be done on a national basis or phased in regionally? If a region-by-region approach is preferred, due to logistics, resources, or other reasons, what criteria should be used for priority setting (e.g., which areas use the most mercury, have the greatest health or environmental impact, are most accessible, and are most receptive to interventions or education)?
- Who needs to agree to/ not oppose these planned initiatives? Who needs to actively champion these activities?
- How well do the potential strategies and actions address the national objectives and reduction targets? How well are they aligned with existing related national strategies or programmes, for example in the mining, health, environment, or labour sectors?
- What organizations might be contacted to help advance the implementation strategy (e.g. intergovernmental organizations, governments, private sector, local NGOs, and mining groups)?



- Do the key implementing partners have adequate capacity to support the required activities, and if not, what options are available to address critical capacity gaps?
- Are there still gaps in the knowledge base? Do additional studies need to be conducted to fill in these gaps? How can implementation be carried out despite these gaps?

To create the implementation strategy, the working group should formulate a list of actions and strategies under each of the required elements of the NAP. Chapter 5 of this document describes each required element of the NAP, and provides recommendations for specific activities that countries may include in the NAP implementation strategy to comply with each of these obligations. Strategies should reflect the requirement elements of the NAP as set forth in Annex C and therefore must include:

- Actions to eliminate the four worst practices (i.e., whole ore amalgamation; open burning of amalgam; burning amalgam in residential areas; cyanide leaching in sediment, ore or tailings to which mercury has been added without first removing the mercury);
- Steps to facilitate formalization or regulation of ASGM;
- Strategies for promoting the reduction of emissions and releases of, and exposure to, mercury in ASGM, including mercury-free methods;
- Strategies for managing trade and preventing the diversion of mercury and mercury compounds from both foreign and domestic sources to use in artisanal and small-scale gold mining and processing;
- Strategies for involving stakeholders in the implementation and continuing development of the plan;
- A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury. Such a strategy should include, inter alia, the gathering of health data, training for health-care workers and awareness-raising through health facilities
- Strategies to prevent the exposure of vulnerable populations, including children and women of child-bearing age; and
- Strategies for providing information to artisanal and small scale miners and their communities.

Countries may wish to include other strategies to achieve their objectives. Paragraph 2 of Annex C of the Convention mentions the introduction of standards for gold produced by ASGM using mercury-free methods, and market-based mechanisms or marketing tools. Chapter 6 of this document provides information on additional strategies.

When considering the inclusion of particular strategies and actions in the NAP, the working group should consider what specific steps and resources are needed to implement these strategies (financial, technical, human, political, and social). The working group may also want to consider identifying strategies for regional cooperation that can support change in the sector (e.g. regional coordination on training, tracking trade, and raising awareness). Finally, the working group may consider how the legal/regulatory status of artisanal and small-scale mining may affect the feasibility and timing for interventions.

Where possible, the working group should refer to the progress of the Post-2015 Agenda of the High Level Political Forum on Sustainable Development and strive to develop linkages of planned activities to high level national development goals and initiatives, such as poverty reduction strategies and Millennium Development Goal-based national development plans, as this can play a role in raising the profile and priority of the activities at the national level and in leveraging resources. A useful general overview of how the sound management of chemicals relates to the Millennium Development Goals was developed jointly by the United Nations Development Programme (UNDP) and UNEP and is available on the UNDP web-site<sup>4</sup>.

Once general strategies have been identified, the working group should elaborate on these strategies and actions by developing:

- A workplan
- An outreach plan
- A timeline
- An overall budget

#### **4.4(a) Workplan in support of the NAP in ASGM objectives**

The working group should develop a clear workplan of activities to implement the chosen strategies. The workplan should list the planned activities associated with each objective and how the activities will be implemented (activity, purpose, timeline, estimated budget, activity lead, expected results). It will be helpful if the most critical activities in the plan are highlighted, as this will help prioritize needs for resources and technical assistance. The working group may consider creating a logical framework to describe strategies and activities, as this structure may help articulate the strategic thinking behind the workplan, and will be useful when requesting external assistance.

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<sup>4</sup> [http://www.undp.org/content/undp/en/home/librarypage/environment-energy/chemicals\\_management/](http://www.undp.org/content/undp/en/home/librarypage/environment-energy/chemicals_management/)

The roles and responsibilities of working group members, as well as other stakeholders, should be identified in the workplan. The working group should assign the tasks to a lead department or organization best positioned to implement the activity. For example:

- Tracking mercury use may be assigned to the relevant government department on trade as the lead, working closely with mining organizations and customs officials.
- Educating nurses and health care workers on the dangers of mercury and reaching out to miners and their family could be assigned to a health department or organization, working closely with other health promotion actors such as community based organizations.

Annex 4 provides an example format for a workplan for the NAP.

#### 4.4(b) Outreach Plan

The working group should produce an outreach plan to raise awareness about mercury and its risks, the use of mercury in ASGM and the NAP itself. The outreach plan should provide a road map for involving critical stakeholders and marginalized groups in the development and implementation of the NAP and provide opportunities for constructive engagement and participation. To create an outreach plan, the working group may consider the following steps:

- **Setting a goal** for the outreach plan not only provides direction, but also is helpful in setting the parameters for the plan so that progress can be measured over time. Developing an overall goal will require adequate understanding of the initial conditions in the country, as outlined in the national overview.
- **Identify target audience(s).** A target audience may be one or several relevant groups or sectors. These can include relevant government officials whose support is needed to implement the NAP including officials responsible for providing budgetary resources for implementing the NAP. Other target audiences include miners (women and men), processing plant operators, public health personnel, relevant business leaders, teachers, elementary schools, children, and women of child bearing age or pregnant women who may be exposed to mercury.
- **Develop relevant messages for each audience.** Messaging needs to be simple, relevant, and attractive to gain the target audience's full attention.
- **Develop a list of the existing and planned outreach activities** for each target audience (including a timeline, responsible organization, budget, outreach potential of the activity). In developing the activities, care should be taken to review and consider

broader environmental and health protection outreach initiatives within a country, so that the outreach plan is not undertaken in isolation or in a fragmented way. It should also link to existing programs and networks as much as possible and should build on past and current experiences. Some of these outreach activities may need to be initiated prior to completion of the NAP. Activities may include:

- Public meetings and workshops are useful to deliver messages to small groups and can be effective in covering topics in-depth.
  - Printed material such as leaflets, posters and/or stickers draw attention to the issue and can be made appropriate for most audiences.
  - Large-scale publicity such as signs, radio or television advertisements or public service announcements can also be effective in drawing attention to an issue. Media campaigns can be expensive if they involve advertising. Some newspapers, radio and television stations, however, may set aside space/time for free public service announcements.
  - On-site training is appropriate when detailed information is required to make a difference. It is often best received from local people and most effective with repeated follow-up.
  - Outreach to schools-targeting ASM children,
  - Experience exchange in-country and promotion of pilot actions.
- **Consider roles and existing resources.** When considering how to implement the outreach plan, the working group should consider:
    - Are there existing networks in place to deliver the message to miners and their families?
    - What role could governments, civil society, the private sector, and the health sector play in promoting alternative practices?
    - Are resource materials available and relevant? What other outreach materials are required?
    - Whose resources can advance the outreach plan?
  - **Monitor and evaluate.** It is important to monitor and evaluate the outcome of the Outreach Plan. Communication is an adaptive process. Some activities or strategies will work, while some will not. By creating a monitoring and evaluation structure, at regular intervals, adjustments to the plan can be made throughout the implementation period.

#### 4.4(c) Timeline

The working group should define a timeline for the NAP. A sample timeline is included in Annex 4 as a part of the workplan format. The timeline should contain project “milestones” that correspond to the national objectives set forth by the working group and should align with the mercury use reduction targets. Because project milestones are reference points that clearly mark distinguishable events in the NAP, the project milestones can be used as a tool to monitor progress as the NAP is being implemented.

#### 4.4(d) Budget

The working group should ensure that resources necessary to implement the NAP are accounted for in a budget in a detailed and comprehensive way (to include financial and in-kind resources).

A successful workplan in support of the NAP does not necessarily require a large budget, but rather a budget that is well-managed, realistic and enables the national plan to be implemented successfully at minimal cost. Costs are especially minimized when the working group is composed of a wide range of members, as the resources of each member’s organization or interest can be pooled together. Also, creating a NAP that is compatible with other governmental policies will prevent situations where the NAP is undermined by other programs or undermines pre-existing policies. Resources should be allocated to ensure miners’ participation at each step of the decision-making process.

Additionally, a focus on sustainable financing, linked to legal and institutional frameworks, can add to the NAP’s success. Within its NAP, a country should identify possible funding sources available to them, including commercial and in-kind resources available. These should also include bilateral, multilateral, and community-based financing schemes. In particular, Article 13 of the Minamata Convention states that “The Global Environment Facility (GEF) Trust Fund shall provide new, predictable, adequate and timely financial resources to meet costs in support of implementation of this Convention as agreed by the Conference of the Parties.” Currently, during the period before the Convention enters into force, the GEF has set aside funds for enabling activities and pre-ratification projects, including the development of NAPs. The working group should consult the GEF and its guidelines when considering applying for these funds. Subsequent financial assistance from the GEF will look towards the national objectives and reduction targets, including those outlined in the NAP.

## 4.5 Developing an Evaluation Process for the NAP

Each country that is required to submit a NAP is required to report on progress made in meeting its obligations under Article 7 every three years, and must include this progress review in reports submitted under Article 21. To meet this obligation, countries should develop a clear process for evaluating progress in implementing the NAP. This should include a periodic review of the NAP (prior to the three year reporting period), monitoring, and an evaluation of for activities according to the agreed milestones. The evaluation process may include a combination of several different approaches, including:

- An internal review by each ministry or other entity involved in the NAP implementation, with attention to the progress made against expected results in the agreed workplan for that entity;
- External evaluation by independent evaluators not involved with the implementation of the NAP;
- Ongoing evaluation of individual projects.

The working group should create metrics by which to evaluate progress towards each objective of the NAP. Sample metrics may include:

- Number of mining areas/communities where activities have been initiated;
- Number and effectiveness of communication tools developed to engage stakeholders and miners;
- Efficiency and effectiveness of measures undertaken to reduce mercury use and to encourage adoption of cleaner gold production alternatives;
- Efficiency and effectiveness of measures undertaken to reduce mercury emissions and loss through gold processing/burn off of mercury from amalgam to purify gold;
- Kilograms of mercury use reduced;
- Reduction of mercury levels in the environmental media.

In addition to the above metrics, the following more subjective measures can also be used to evaluate progress:

- Affordability of these measures and/or cost-effectiveness;

- Practicability including socio-economic considerations, which include damages to human health and the environment;
- Effectiveness and level of implementation of needed reforms to address the social, institutional, regulatory and other issues relevant to reducing mercury use in the sector; and
- Effectiveness in addressing urgent health and/or environmental needs.

The working group should develop protocols for collecting data and information during the implementation of the NAP, by which these metrics can be measured. These data should be reported back to the working group and stakeholder advisory group at an agreed frequency (for example, annually). Methods for data collection should mirror techniques used to create the baseline inventory and may include:

- Formal and informal surveys, semi-structured interviews, and/or key informant interviews with the miners, government officials, civil society and others who are affected by the activities;
- Focus group discussions, community meetings, case studies, and/or participatory rural appraisal;
- Direct observation;
- Indirect observation, such as by satellite, in case of remote communities;
- Review of social and economic data collected at a community level for other purposes, such as to support other initiatives on poverty alleviation, health promotion, education, gender studies, etc.;
- Analysis of written documents, and;
- Review of implementation methods.

As part of the evaluation, countries may also choose to conduct updated inventories of mercury use and practices in ASGM, for comparison with the mercury use and practices baseline conducted as part of the national overview in Chapter 4.2 and as described in Chapter 5.4.

The data and information collected can be used to weigh the outcomes against the established metrics, to determine whether or not the objectives are being successfully met. If the objectives are not being fully met, as measured by these metrics, the working group may recalibrate the NAP to ensure a more successful outcome.

Countries may wish to establish a formal platform (e.g., website) for easily sharing data and information collected during the NAP implementation. This mechanism will provide an

opportunity for stakeholders to share information and also review and comment on information provided by others. This information sharing may also benefit other countries implementing NAPs and will contribute to the global knowledge base on ASGM.

Note that data collected to evaluate the effectiveness of the treaty, as required by Article 22 of the Minamata Convention, may include measures taken to implement the NAP, and their effectiveness. In particular Paragraph 2 of Article 22 requires Parties to establish arrangements to collect monitoring data on the movement of mercury in the environment as well as trends of levels of mercury in biota and vulnerable populations. Mercury levels in environmental media, biota, food chains and vulnerable populations living in ASGM communities may be relevant information for the overall effectiveness evaluation as per Article 22 of the Convention. These data can help establish the country situation and guide efforts to reduce and eliminate mercury pollution as well as provide baseline information for addressing ASGM-related health impacts. However, levels can be difficult to interpret and legacy effects of mercury deposition may delay any observed response to reductions in mercury use, emissions, and releases in ASGM. For ASGM, direct measurements of mercury reduction may be more indicative of the effectiveness of the NAP.



## 4.6 Endorsing and Submitting the NAP

As required by article 7, Paragraph 3(b), **each country must submit its NAP to the Secretariat no later than 3 years after the Convention enters into force for it, or 3 years after notifying the Secretariat that it has “more than insignificant ASGM”**, whichever is later. The working group process should clarify who within the Government should submit the NAP, and what entities will endorse the plan before submission.

Obtaining commitment from national decision makers throughout the development of the NAP can facilitate the final submission process to the Secretariat. Different forms of commitment from appropriate national decision makers, such as formal agreements and ministerial directives may be required depending on national protocols. The plan should also be distributed in a timely and appropriate manner, in pre-approved form, to those who have an influence over its approval.



# 5

## Contents of the National Action Plan



## 5. Contents of the National Action Plan

Annex C of the Convention provides direction on content to be included in the NAP for a Party with “more than insignificant” levels of ASGM activity within its territory (see Annex 1 of this document). This chapter of the guidance document provides additional information on each section outlined in Annex C and is meant to serve as a resource for national working groups and stakeholder advisory groups. Where appropriate, examples of content to include and/or actions that can be taken are suggested. While Annex C provides the outline for the NAP, each country will need to tailor the NAP so that it best represents their national context.

### 5.1 National Objectives and Reduction Targets

#### Suggested Actions:

- Establish problem statement;
- Establish goals;
- Establish national objectives and reduction targets, based on review of the national overview

Annex C, Paragraph 1(a) requires that National Action Plans establish national objectives and targets. Countries may consider the following steps when determining these objectives and targets:

#### Establishing the problem statement

A problem statement is a brief description of the specific problem that the NAP will address. While UNEP has identified ASGM as the largest source of mercury pollution globally, and the Minamata Convention includes mandatory obligations to reduce mercury use in this sector, a problem statement specific to the circumstances of a country can help that country articulate its perception of the problem it faces, which can help communicate the need for action to decision makers and other stakeholders.

An example of a problem statement might be:

Artisanal and small scale gold mining using mercury occurs at a significant level in YY country. These activities, and in particular the use of mercury in the sector, have serious long-term environmental and health impacts for people working in the sector and populations living in, near or downstream/wind of such operations. There is a need to promote more sustainable activities in this sector, and to reduce and where feasible eliminate mercury use in the sector, to protect human health and the environment.

## Establishing the goal

The goal is a concise statement that describes the plan's purpose. Consistent with Article 7 of the Minamata Convention, the overall goal of the NAP should be to reduce, and where feasible eliminate, the use of mercury and mercury compounds in, and the emissions and releases of mercury to the environment from, ASGM. Countries may choose to elaborate additional goals for their NAPs with regard to improving the overall environmental and economic performance of the ASGM sector and to address any negative social impacts associated with it.

## Establishing the national objectives and reduction targets

Objectives state, at a finer level of detail than the goal, the specific outcomes that the NAP expects to accomplish. Objectives should answer the question "What needs to be achieved to get from where we are now to where we want to be?" These may include short-term and long-term objectives, or phased objectives. Every objective should be designed using the "SMART" criteria. Objectives should be:

- Specific
- Measurable
- Assignable
- Realistic
- Time-dependent.

As required by Annex C, Paragraph 1(a), the objectives should include specific reduction targets.

An example reduction target might be:

To reduce mercury use by ZZ% by XX date through elimination of mercury intensive and unsafe practices of mercury use, the adoption of mercury control and capture technologies, and/or the adoption of mining techniques that do not require mercury use.

A phased reduction target might be:

To effectively reduce mercury use in the ASGM sector, based on the quantities determined by the baseline inventory, by 25% in 2015, 45% in 2017 and a further 25% by 2021 through the (a) elimination of mercury intensive and unsafe practices such as, but not limited to, whole ore amalgamation, open burning of mercury amalgam without using retorts or other mercury capture devices, and (b) migration to reduced mercury or mercury-free practices or technologies.

Where feasible, countries may aim to completely eliminate mercury use. In this case, an example target might be:

To eliminate mercury use in ASGM through the adoption of mercury-free mining practices in region XX by 20XX and nationally by 20XX.

Mercury use reduction and elimination targets may also relate to the management of mercury supply, in order to decrease or eliminate supply and reduce exposures. For example:

To develop and promote the safe handling and long-term storage of excess mercury coming from the ASGM sector, which may include but are not limited to mercury suppliers, dental shops, gold dealers, reclaimed tailings, etc.

Annex C, Paragraph 2 also gives countries the flexibility to “include in its national action plan additional strategies to achieve its objectives”. Given that the NAP will include activities that interlink with health, education, formalization or regulation, market access, and environmental impacts, countries might also wish to articulate other objectives to cover such governance, environmental, and social aspects within the NAP. Examples of some other objectives may include:

- To develop and implement, by XX date, national policies and regulations that promote the improvement of ASGM and its allied sectors, and encourage alternative livelihoods where feasible, as well as environmental and safety measures to protect miners and communities surrounding ASGM sites.
- To require that ASGM primary license holders or mine managers develop and implement Environmental Action Plans by XX date in YY region, that also include safety measures to protect employees and prevent exposures in residential areas.
- To establish by XX date, a formalized and organized group of ASGM miners with a national constituency and representing the needs of the ASGM sector, such as those existing for other industrial associations.
- To build and strengthen institutional capacity via the establishment by XX date of departments of ASGM (or a sub-group focused on ASGM) within the appropriate ministries (e.g., mines, environment, finance, health, trade).
- To export XX% of ASGM-produced gold to the international market via markets that utilize mercury-free gold.
- To produce XX% of gold without the use of mercury or other toxic substances.
- To reduce environmental level (or exposure) down to XX% of current level.

Stakeholder involvement during the development of these objectives will help to ensure that the objectives are reasonable and obtainable.

## 5.2 Actions to Eliminate Worst Practices

### Sample Actions to Eliminate the Worst Practices:

- Identify which worst practices are being conducted and where;
- Provide miners with training on techniques of reduced and zero-mercury mining;
- Identify financial and technical mechanisms that will assist miners with the transition from worst practices to reduced- and zero-mercury mining practices;
- Establish land-use policies that prohibit the burning of amalgam within residential areas (*e.g., amalgam burning must be conducted “XXX distance” from any residential area using proper mercury capture devices and recycling equipment*);
- Collaborate with mining equipment distributors, mining engineers and others to provide long-term technical assistance to miners;
- Collaborate with large-scale mining operations to remove and process mercury-contaminated tailings that would include cooperation between large- and small-scale miners.

Annex C, Paragraph 1(b) requires that NAPs include actions to eliminate a set of four worst practices in ASGM:

- whole ore amalgamation;
- open burning of amalgam or processed amalgam;
- burning of amalgam in residential areas; and
- cyanide leaching in sediment, ore or tailings to which mercury has been added without first removing the mercury.

As described in Chapter 2.2, whole ore amalgamation (WOA) occurs when miners add mercury to a large amount of the ore with little prior concentration. WOA is not effective at obtaining high recovery of gold from ores and cost effective alternatives, including simple concentration methods, can provide miners with higher gold recovery while using much less mercury (UNEP 2012a). To eliminate WOA, governments should take actions to encourage miners to adopt lower-mercury concentration methods and/or mercury-free methods (discussed later in Chapter 5.5). Banning the practice can be an effective action when coupled with assistance to miners to transition to other practices (or even to other livelihoods, where feasible).

### **Whole Ore Amalgamation (WOA)**

occurs when most of the mined material is brought into contact with mercury. This is a very mercury intensive process. In practice, this means that between 10% to 100% of the mined material (a very large mass) is brought into contact with mercury, usually when mercury is added directly to milling processes or when a slurry is passed over mercury coated copper plates. Mercury use can range from 3 to 50 parts of mercury per unit of gold produced and large amounts of mercury are released to the waste (tailings). This strongly differs from "concentrate amalgamation" where less than 1% (1/100) of the ore is brought into contact with mercury after a significant amount of concentration of the ore has been done. In concentrate amalgamation, mercury used per unit gold produced is around 1.3:1 with most of the mercury going into the amalgam where it can be recycled or captured using a mercury capture device.

Two of the actions to eliminate, discussed already in Chapter 2.2, are the open burning of amalgam and the burning amalgam in residential areas. Where feasible, countries should introduce mercury-free alternatives that will eliminate the need for amalgam burning altogether. Countries can also adopt immediate actions to prevent open burning by requiring the use of mercury capture devices such as retorts. Policymakers should be aware that mercury capture devices are most successfully employed in locations with a relatively high through-put of mercury/gold amalgam, such as centralized processing centers or gold shops. Incentives to promote the widespread and rapid adoption of mercury capture devices should be considered in the NAP. Strategies to promote the use of retorts and other capture devices should also include a protocol for the proper handling and storage of retorts to prevent unintended exposures from mercury adhering to and continuously released by these devices after use, or of their use indoors. Detailed descriptions of retorts and other mercury capture devices are available in UNIDO's training manual (UNIDO 2006), in UNEP's guide to reducing mercury in ASGM (UNEP 2012a), and in the USEPA's technology demonstration of mercury capture systems in gold shops (Argonne National Laboratory 2013).

The NAP must also include actions to eliminate amalgam burning in residential areas. Actions may include establishing a minimum distance from populated areas. As an example, UNIDO (2008) recommends that any processing of any amalgam should be conducted at least 500m from residential areas. The distance chosen should consider how best to protect populations at risk, and this may depend on population density, geography, and a variety of other factors. To support these choices, countries may consider gathering concrete information on exposures of women and children in residential areas. As another example, countries may also consider making amalgamation areas off-limits for all people who are not working there, and for all children.

Adoption of mercury-free processes will also eventually eliminate cyanide leaching of newly generated mercury-containing sediment, ore, or tailings. However, for existing mercury-contaminated tailings from previous operations, or for those ongoing operations still using mercury, the residual mercury must be removed (e.g. by concentration) from the tailings prior to leaching.

Because the use of cyanide is already generally closely monitored and licensed, countries may work with cyanide processors to develop methods/ protocols to avoid treating mercury-contaminated materials. Countries may also require cyanide processors, as part of licensing, to refuse to accept mercury-contaminated tailings, or to undertake removal of mercury prior to use.

Countries may also engage in demonstration projects and training on the economic benefits of the decontamination of mercury-contaminated tailings, which may include the profitable recovery of gold left in the tailings.

### **5.3 Steps to Facilitate Formalization or Regulation**

Annex C, Paragraph 1 (c) of the Minamata Convention requires that each NAP must include “steps to facilitate the formalization or regulation” of the ASGM sector. Formalization is a process that seeks to integrate the ASGM sector into the formal economy, society and regulatory system. Formalization is seen by many as an important step for the ASGM sector to harness its potential as a tool for poverty alleviation and improvement of working conditions while helping to overcome social and environmental challenges, since a more formal ASGM sector will enable outreach not only on mercury management but also on the full range of social, environmental, and economic development issues related to ASGM. Formalization may include reforming the legal status of ASGM as well as the formulation of policies among a variety of agencies and institutions (mining, education, health, labor, environmental management, finance, social services, etc.) that address the different dimensions of ASGM activities.



**Sample Actions:**

- Develop and carry out a plan for stakeholder engagement and participation in the formalization process;
- Develop a vision for the ASGM sector. Options may include decentralized small to medium enterprises, cooperatives, and other models;
- Perform policy and regulatory review, and amend laws and regulations as necessary to encourage formalization;
- Review of the institutional capacity required by formalization and identify resources to enhance this capacity;
- Consider strategies to improve monitoring and enforcement of ASGM requirements;
- Facilitate access to markets by improving laws, regulations and administration related to gold sales;
- Consider using special tax regimes, royalties, and fees as incentives for formalization;
- Develop initiatives to improve miner access to credit and financial management skills.

For the purposes of this guidance document, regulation is the development and imposition of standards or laws that affect either the individual miners or the ASGM sector. Some examples are the imposition of laws protecting the environment or labor laws protecting against child labor in mining areas.

The end goal of formalization is the integration of the ASGM sector into the formal economy and society as a whole, including a comprehensive framework of applicable laws, regulations, and policies. Regulation alone can have a narrower focus, such as regulating a specific or set of behaviors or processes without necessarily involving the full formalization of the ASGM sector.

The following section elaborates on steps that countries may consider in order to facilitate formalization<sup>5</sup>. Because each country has its own national or local process to develop and promulgate laws or regulations, this document will not discuss these specific national processes.

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<sup>5</sup>This discussion is primarily excerpted from the UNEP report entitled *Analysis of formalization approaches in the artisanal and small-scale gold sector based on experiences in Ecuador, Mongolia, Peru, Tanzania and Uganda* (UNEP, 2012b) and associated case studies.

### 5.3(a) Stakeholder Engagement and Participation

Stakeholders in the formalization process may include miners, government agencies at national, provincial or local levels, trade unions, entities in the ASGM supply chain, as well as entities that benefit from ASGM, local shop owners, and those parties that can be impacted by ASGM, e.g. downstream and surrounding communities and large-scale mining interests.

Any formalization or regulatory effort should begin with stakeholder engagement and participation. Effort should be made to ensure that all stakeholders participate not only at the initial stages, but more importantly at the finalization and implementation stages. Stakeholder engagement and participation is further discussed in Chapter 5.10 of this document.

### 5.3(b) Policy and Regulatory Review

A review of existing mining policies, laws and regulations that govern ASGM, as well as the level of institutional support available for implementation and enforcement can help countries identify gaps and needed adjustments to facilitate formalization. Ideally, this policy and legal review should include all levels of government that have authority over ASGM, especially local government.

Any gaps discovered in ASGM policy, laws and regulation may be addressed by either development of new policy or legislation, or reform of existing policy or legislation. For example, where ASGM is not already specifically addressed, simplified laws, regulations and sanctions tailored to the ASGM sector can be developed. Including legislation related not only to mining codes, but also laws linked to development, environment, health and safety, labor, social welfare, child protection, trade, tax and other legislation.

When making revisions to ASGM laws and policies, legislators and regulators may consider the following issues:

- ➔ **Definition of ASGM activities:** The definition of ASGM is critical in subsequently defining licensing, financial and environmental requirements that are appropriate to this sector. Legally recognizing the many different types of ASGM is often an important first step for creating regulations that provide appropriate levels of control for each different type of activity<sup>6</sup>. Note that there are many definitions of ASGM used around the world, and each country will have to define ASGM based on its own national context.

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<sup>6</sup> “Artisanal”, “family”, “micro”, “small”, and “medium” are five categories of classification that are in use in various mining codes. Definitions are often based on: (a) the maximum amount a group can invest, (b) the maximum extraction capacity, (c) the maximum land area that can be covered, (d) the technology that is permitted, and (e) number of miners involved.

➔ **Mining titles and related obligations and rights:** A mining title defines both the rights and obligations of the holder<sup>7</sup>. It can be a useful tool to set the stage for formalization, and can be a tangible incentive for miners to formalize. A common barrier to titling ASGM is pre-existing land use and allocation. In many countries most viable land has already been assigned to medium or large scale concession holders. To address this problem, some countries reserve areas specifically for small scale mining. In other cases, mining titles expire after a defined period of time when the land is not being developed, which opens up more land for ASGM (and other new title holders)<sup>8</sup>.

Administrative processes for mineral titles can be excessively complicated for miners, often requiring expensive fees and travel to distant cities. To address these constraints, regulations could consider:

- Assigning a strong role to local organizations and district offices in awarding titles and licenses.
- Assisting miners in navigating the permitting process.
- Making the process clear and forms simple.
- Setting reasonable fees.

Countries could also consider similar reform of the administrative process for other aspects of the ASGM supply chain (e.g. gold buyers, etc.)

#### Elements of mining titles to consider:

- **Duration and renewal of the title:** Licenses that are easy to renew and have a long duration help ensure stability of the operations and encourage miners to operate with a longer-term perspective in mind, and adopt best practices.
- **Transfer and upgrade of titles:** The ability to transfer mining rights and upgrade mining titles provides business flexibility to miners and can also be an incentive to adopt better practices.
- **Types of entities allowed operating under an ASGM mining title:** Titles or licenses should recognize the range of different types of organizational structures in the ASGM sector within the country. Countries may choose to encourage ASGM to be organized into cooperatives and other legal entities.

➔ **Environmental licenses:** Obtaining an environmental license can be a major obstacle for miners to attain formal status. Onerous requirements for licenses and high administrative costs are common disincentives. Countries may consider simplifying these requirements in a manner that could be tailored to different categories of ASGM defined in the law, for example that make the licensing requirements commensurate with the expected environmental risk involved. Stringent licensing for

<sup>7</sup> A license to operate may be separate from the mining title.

<sup>8</sup> Further, to adequately support the titling system, regulators may consider the development of a real time cadastral system that allows easy and reliable access to information about where titles have been assigned, encouraging transparency and acting to reduce local land disputes.

mercury free or mercury reducing operations may have the unintended effect of delaying formalization of these processes. As a result, miners may continue using mercury intensive practices rather than seek licenses.

➔ **Pollution control measures:** Pollution control measures largely take the form of prohibitions, bans, or restrictions on inputs or practices. These may include:

- Restriction of mining in river beds and environmentally sensitive areas;
- Restrictions on mercury use and technologies. Countries may choose to place restrictions and/or bans on the use of mercury, and on the “worst practices” identified in Annex C, Paragraph 1 (b). However, in the absence of alternatives, blanket bans and restrictions, can push artisanal and small-scale miners into non-compliance, out to locations outside of the practical reach of formal monitoring and enforcement measures, or into illegal trade of toxic inputs or gold. For these reasons, countries could consider coupling restrictions with technical assistance to help miners transition away from mercury, especially the worst practices;
- Requirements for buying, importing, using, and storing mercury or other toxic/dangerous (e.g. explosives) inputs in the context of ASGM;
- Restrictions on other specific ASGM practices, such as improper mine waste management, deforestation, and other practices that adversely impact the health and environment may be prescribed.

➔ **Rehabilitation and mine closure:** Provisions should be made for the rehabilitation and closure of mines, and decontamination of specific areas. Making miners accountable for legacy of their activities through such provisions can encourage better environmental stewardship from the beginning of operations. Prevention is critical, because ASGM miners often lack sufficient resources required for reclamation of mercury contaminated materials.

#### Ensuring Miner Accountability for Rehabilitation

- Countries may consider creating comprehensive regulatory guidelines for mine closure designed specifically for ASGM.
- In some cases, reprocessing of tailings to recover gold can contribute to the cost of rehabilitation of mine sites. However, care must be taken to avoid fugitive emissions and releases of mercury, and exposure of those involved, during these recovery operations.
- Post-mining land tenure rights could be granted so that miners could convert the land to other uses, although such uses would have to take into account, and may be limited by, potential long-term impacts of mercury contamination which are difficult to address through clean up measures.

➔ **Other measures:** Mining, labor and child protection laws and regulations, as well as mining or labor inspections regimes, may also provide prescriptive measures that cover worker safety, health, child labor, and measures that protect downstream communities, indigenous communities, and women. Chapter 7 contains additional information on gender and child labor issues in ASGM.

### 5.3(c) Review the Institutional Capacity and Identify Resources for Enhancement

In addition to reviewing the laws, regulations and policies related to ASGM, countries may wish to review the allocation of responsibilities and capacity of its institutions to implement these regimes, and to identify ways to enhance these capacities.

Laws typically identify an Implementing Agency/Primary Authority/Focal Point responsible for supervision, coordination, and implementation of the legislation. For ASGM, the main implementing agency is typically the ministry of mining or mineral exploitation. However, the multi-dimensional nature of the ASGM issue calls for collaboration among a number of government agencies, including local government entities and stakeholders.

Clear allocation of responsibilities is important for effective enforcement. Parliament or Congress can play a role in creating an over-arching policy on ASGM, and aligning the various ministries on how ASGM is viewed and regulated. Once ASGM regulations are passed, the responsible agencies will need resources to implement them. For example, the licensing agency will need resources to process applications in a timely manner or they will lose their credibility and the formalization process will be jeopardized.

Decentralization of responsibility for ASGM, and the capacity of the provincial or regional, municipal and national government institutions to deal with ASGM, should be considered. If responsibility is decentralized, local governments will need resources (financial, technical, and human) to implement the requirements.

Besides government, other actors in society can also contribute knowledge and resources to the formalization process, including miners' associations and trade unions, large-scale mining companies, and academia (such as schools of mines that can provide technical research and assistance). Countries should consider how to best mobilize these resources as part of the overall formalization plan. Positively engaging marginalized ASGM groups in formalization processes can strongly enhance the success of the effort.

### 5.3(d) Consider Strategies to Improve Monitoring and Enforcement

Monitoring and enforcement is essential to reduce the levels of illegal activities within the ASGM sector. Monitoring and enforcement activities may include regulation of the mercury trade at borders, ports and at the local ASGM level to minimize illegal imports. There is often a lack of capacity in national government mining and environmental institutions to monitor and enforce the ASGM sector regulations. For these reasons, countries may consider efforts to simplify enforcement processes. Countries may also consider expanding the role of the local or provincial government in monitoring and enforcement through mining district posts, departments, or offices, while central authorities could still retain a general oversight role. Recent satellite technology may help countries to monitor remote places of difficult access. Countries may also want to combine monitoring and enforcement with positive efforts to provide assistance and incentives to help bring miners into compliance.

### 5.3(e) Consider Strategies for Facilitating Access to Markets and Creating Economic Incentives

An important element in the transition of miners into the formal sector is the economic and market incentives that governments can set. The following points discuss the various economic or market-based elements that may be considered when developing strategies, suitable to country-specific realities, to facilitate formalization of ASGM.

- ➡ **Facilitating access to markets.** Countries may consider providing a simplified access to gold buying channels, to help miners who reduce or eliminate mercury use to increase their income and bring the gold production into the formal economy.<sup>9</sup>
- ➡ **Taxation regimes.** Currently there are three common approaches for tax regimes in ASGM: (1) the ASGM sector is taxed the same as any other economic sector, based on the revenues of the operations; (2) the sector is taxed using regimes similar to taxation of independent workers; and (3) lower tax rates are applied, compared to other sectors. Countries may choose a combination of these approaches, according to their specific circumstances. Note that a low tax burden on the ASGM sector and a simple tax regime may encourage miners to enter the formal economy, which may lead to an increase in tax revenue. Further, governments may consider creating provisions for

<sup>9</sup> Note that additional licenses and other administrative requirements are often requested in order to sell or export gold. Such requirements (e.g. certified evaluation of the gold, restrictions on quantities to be evaluated) can pose challenges for miners and can create security and cash flow obstacles that prevents many ASGM mining operations (including legalized ones) from selling directly into the formal economy. Therefore, as a means to support inclusion of gold sales in the formal economy, some governments choose to pay ASGM miners a spot price (or above) for gold. Likewise, miners can be provided tax incentives and other deductions as a means to support inclusion of gold sales in the formal economy. Governments can also ease the sale of gold by having decentralized locations for purchase and establish transparency in the supply chain.

local governments to generate revenue from the sector as well, especially in cases where local governments play a key role in monitoring and enforcement.

- ➔ **Royalties.** Countries have adopted different strategies to setting royalties for ASGM. Some have created special royalty rates as a function of the size of the operation and type of minerals extracted. In the countries examined in the UNEP case studies (UNEP 2012b), royalties for the ASGM sector vary from 0.2% to 5%. With the fluctuating market price of gold in mind, other countries have taken an innovative approach by varying the royalty rate according to the market price of gold.
- ➔ **Fees.** Countries may want to evaluate appropriate levels for administrative fees that will encourage miners to enter the formal economy.
- ➔ **Regional harmonization of taxes, royalties, and fees.** The consistency of fees and taxes across a sub-region can influence the participation of miners in the formal economy. Illegal traders can take advantage of differing market conditions in a sub-region and may gravitate towards the country with most advantageous market conditions that could undermine the tax, royalty and fee regimes of neighboring countries.
- ➔ **Promoting miner access to credit and improving financial management skills.** Lack of access to formal credit markets as a result of the informal nature of the sector is a common barrier to miners' implementing change. Artisanal and small scale mines often do not qualify for funds from commercial banks and sources of direct credit due to lack of collateral, unclear legal status, and an inability to establish the potential profitability of their projects. However, financing for miners can be important to their ability to invest in equipment and processes that allow them to transition away from mercury. Therefore, countries may consider developing various initiatives for creating better access to credit and financial gain for miners. When developing such programs, countries should consider the following:

- Using credit or loans as a “donation” or “gift” should be avoided because providing capital for free can create distortions and dependencies that would be difficult to correct in the future;
- The interest and the period of pay back of the loan need to be appropriate to the miner's ability to pay back;
- Engagement with banking/micro-financing institutions may make those sectors more comfortable with providing financing to ASGM.

Some mechanisms for increasing access to financing may include:

- Supporting the formation of formal entrepreneur groups such as miners associations with commercial companies;
- Formalizing traditional funding systems by promoting the following: hire-cum purchase system, forward sales, and mutual group savings schemes;

- Encouraging financial institutions to formulate affordable credit schemes to the miners as well as establishment of mobile banking systems, e.g. through favorable lending policies;
- Promoting the use of third-party guarantees to enable other institutions to assist miners to get loans;
- Facilitating the creation of mineral property markets to enable discoverers to sell their properties to developers at competitive prices;
- Encouraging NGOs to establish miners' cooperative banks and informal financial institutions such as rotating savings and credit associations;
- Encouraging miners to increase their income through value-addition activities;
- Arranging a Mining Development fund to finance simple mining equipment.

In addition to providing access to credit, government efforts may also endeavor to improve personal financial management skills of miners to ensure that they are capacitated to manage their earnings. These measures will be complementary.

## 5.4 Baseline Estimates of ASGM Mercury Use

### Sample Actions:

- Establish positive relations with miners at key sites;
- Develop a baseline team that understands the technical, social, economic, political, and ore processing context;
- Optimize geographic and demographic sampling to ensure representative and confident assessments of the ASGM sector within the country;
- Build the inventory using multiple lines of independent evidence, then repeat to evaluate long-term change.

Annex C, Paragraph 1 (d) requires that the NAP include “baseline estimates of the quantities of mercury used and the practices employed in artisanal and small-scale gold mining and processing”. Many countries will have already made some baseline estimate of mercury released from ASGM in their Minamata Initial Assessments. Baseline estimates of mercury use in mining enable governments to prioritize and develop effective intervention strategies. Most ASGM operate in the informal economy, and this presents special challenges when undertaking field surveys. For this reason a successful and accurate inventory will likely rely on a variety of direct and indirect types of information, provided by a diverse sample of community members. Using the recommendations outlined here, there is a small but growing amount of information about ASGM mercury use and loss globally. Each country's contribution to this global inventory significantly improves our understanding of mercury flows in ASGM and the means by which to reduce them. For the latest



global inventory, see the 2013 Global Mercury Assessment (<http://www.unep.org/PDF/PressReleases/GlobalMercuryAssessment2013.pdf>).

[www.mercurywatch.org](http://www.mercurywatch.org) is another useful resource for accessing country-level estimates of mercury use in ASGM.

### Collecting inventory information

A thorough field-based inventory requires specialized expertise, good relationships with mining communities, and extensive field work to collect information of adequate quality. Personnel making the estimation should understand ASGM practices, the use of mercury in ASGM, and the informal gold trade, and be capable of developing a comfortable interaction with miners and community members under field conditions.

Broadly speaking, there are five main approaches that can be used to estimate mercury use in ASGM. These include:

- Direct measurements
  - Track mercury quantities used and lost in each step of the mining and processing.
- Intensity based estimates
  - Apply a mercury/gold (Hg:Au) ratio to estimate mercury use given estimates of gold production.
  - An independent estimate of the cost of living in ASGM communities and their population is useful to evaluate estimates of gold production
- Interviews
  - Miners (including men, women), gold merchants, mercury suppliers (which includes industrial chemical suppliers, in some countries), financiers, local bank staff, health care workers, and members of the community.
- Official trade and census data
  - Use as only one type of input, since official data often does not capture the full extent of informal activities. However, discrepancies between data on legal and illegal shipments can provide insight into the mercury trade.
- Information on other potential sources of mercury
  - In some countries, mercury is recovered from contaminated sites, including tailings previously worked with mercury. Some countries may have specific waste management programs in place for dealing with such mercury but in other places, this mercury may serve as a source of supply for ASGM.

Reliable baselines triangulate several lines of independent evidence in order to generate more confident estimates. Other useful information types include:

- Production quantities of ore and gold.
- Revenues and operational expenditures for miners, groups of miners, or whole sites.
- Population data on miners and other participants (disaggregated by mining style or activity, gender, and age).
- The socio-economic structure and wealth distribution of the mining operations and community.
- Costs of living and other goods on mine sites versus in villages and cities.
- The geographical extent of operations determined by survey or imagery.

A list of sample questions for collecting information needed for a baseline inventory is provided in Annex 3 of this document, as part of the sample data collection questions for the national overview. Annex 5 of this document includes an excerpt from AMAP/UNEP (2013), which provides an illustration of how to combine multiple lines of evidence to arrive at a reasonable baseline estimate of mercury use in ASGM.

### **Direct measurements and intensities**

Direct measurement involves weighing quantities of mercury applied and recovered in each processing step. This includes comparing the weight of mercury flasks (or other vessels) before and after mercury is applied, and comparing the weight of amalgam before and after it has been burned. Not all mercury is applied and recovered or emitted in the same places, therefore it is important to expand the survey beyond the mine sites to the towns in which the gold is commercialized, and anywhere else there might be processing or refining services. This often includes gold shops where sponge gold that contains residual mercury is melted and purchased. It is impractical to directly measure all mercury and gold flows in an entire mining town, watershed or region. However, a representative sample of operations in each key mining area, studied in detail, can be used to scale estimates up to the regional and national level.

Most miners in a given region use similar mineral processing techniques, so the average amount of mercury lost for each gram of gold recovered (the Hg:Au ratio) is a useful measure of the mercury emission intensity in that region. A reliable estimate of gold production for that region, multiplied by the emission intensity, can produce a reasonable estimate of mercury losses for the region. This is typically the most accurate way to estimate mercury use because miners and operators rarely keep records or even know how much mercury they use whereas quantities of gold are convertible into a known monetary value and therefore much better known. Estimates of gold production can be derived from the number of miners actively mining and their average yearly gold production

(derived from daily and monthly estimates), or from other sources such as government reports on gold production, mining populations, and costs of living and operating as elaborated below. Different operations emit mercury at different intensities, so information on the distribution of mining practices is required to reliably scale estimates up to the regional level.

Mercury emissions vary according to the type of processing techniques used. Obviously, moving from whole ore amalgamation to concentrate amalgamation vastly reduces the mercury demand of an operation. Table 5-1 shows typical ranges of mercury intensity for various practices.

**Table 5-1: Mercury emissions for different practices (Telmer and Veiga, 2009)**

Mining Practice	Mercury Emissions (Hg: Au ratio)*
Whole ore amalgamation	3-50
Concentration	Average of 1.3
Concentration with use of retorts and Hg activation	0.2-0.1

\*a technical assessment can narrow these intensity estimates at the local level.

In the absence of field-based data on mercury use in ASGM, typical mercury intensities for a given practice can be used as rough approximations. It is important to honestly express the level of confidence in any estimates, based on the quantity and representativeness of samples, and the inherent variability of these values across the landscape and in time. UNEP created initial criteria for developing baseline inventories in the *Toolkit for Identification and Quantification of Mercury Releases* (UNEP 2013). One source of estimates, and uncertainties, of mercury use in ASGM countries is [www.mercurywatch.org](http://www.mercurywatch.org), which can provide a starting point for some countries where data exists, and a repository for new information as more numerous and detailed national ASGM mercury inventories are conducted.

### Interviews and indirect information

All information should be entered into a database where the individual pieces can be cross referenced and compared, and balances and sums can be used to constrain the minimum amount of gold production required to cover all the costs. The estimation of mercury use and the other information obtained can be further checked and constrained through discussion with the various stakeholders such as miners, concession holders, local governments, and national governments. Their feedback and input can provide further insight and therefore help further constrain the estimate. Much of the information required to create a baseline mercury inventory comes from asking questions of various people involved in the sector. A list of potential interviewees is summarized in Table 5-2.

**Table 5-2: Potential sources of information for ASGM inventory**

DIRECT KNOWLEDGE	INDIRECT KNOWLEDGE
Miner (male, female)	Police or Security Officer
Concession Holder	Government Authority
Gold Processor	Goods retailer
Gold Shop Owner	Restaurant owner / staff
Financier	Service provider (e.g. cost of water or electricity or milling a quantity of ore)
Mercury provider (including industrial chemical suppliers in some countries)	Local Organizations
Technical Expert	Geological surveys
Direct measurement of mercury use using weighing scales	Imagery
	Reports
	Health care providers in ASGM areas

### Optimizing a baseline inventory for intervention planning and monitoring

The detailed work conducted during an inventory should cover the diversity of mining types that are common, collect data from enough sites to constrain the mercury intensity estimate (Hg:Au ratio) for a particular mining type, and provide a strong idea of revenues per miner for a select and limited subset of sites. A broader survey that counts sites and site population can then be used to scale the detailed surveys up to the national level. The goal should be to produce a mercury use estimate with an accuracy of +/- 30% and at worst +/- 50%. This level of confidence should be obtainable with a moderate level of effort, time and financial resources, yet should be good enough to inform the NAP and allow priority actions to be decided.

The baseline inventory provides a first estimation upon which to measure progress in reducing mercury use through mercury reduction programs and interventions as obligated under the Minamata Convention. The same methodology should be repeated to evaluate the effectiveness of interventions and in particular the same sites that were studied in detail to create the baseline should be used to again to measure progress in reducing use. Doing so will increase the confidence in the monitoring results.

## 5.5 Strategies for Reducing Emissions, Releases, and Risks of Exposure

Paragraph 1(b) of Annex C of the Convention requires countries to include in the NAP the actions to eliminate the “worst practices” in ASGM, as priority measures. Paragraph 1(e) requires that, in addition, countries must include in the NAP strategies to promote the reduction of emissions, releases and exposure<sup>10</sup>. These should be based on the sounds baseline estimations (see Chapter 5.4) and can include immediate and long-term strategies.

### Sample Actions:

- Develop a training program to inform miners of techniques for reducing their reliance on mercury, including improved concentration and zero-mercury techniques;
- Provide miners and gold purchasers with technical assistance including the use of retorts, mercury capture devices and proper storage of mercury;
- Consider land use planning mechanisms that protect natural resources and population centers (*e.g., no handling of mercury within 100 meters of freshwater resources; tailings may not be discharged in or near a water body; no amalgam burning within residential areas*);
- Assist ASGM communities with developing infrastructure for well-contained and managed amalgamation (*e.g., centralized amalgamation sites*);
- Identify sites with contaminated tailings and develop a strategy for containing and/or reprocessing the tailings.

### Immediate Steps for Reducing Emissions and Releases

Immediate measures can be taken to reduce emissions, releases and risks of exposures to mercury from ASGM, even before the longer-term transition to lower-mercury and mercury-free technologies. Immediate steps to reduce emissions to air using mercury capture devices are discussed in Chapter 5.2. Used correctly and routinely, mercury capture devices will immediately reduce exposures to miners and to surrounding areas. Prohibition of amalgam processing in residential areas will also be critical to immediate reduction of exposures, especially to vulnerable women and children.

<sup>10</sup> In the context of the Convention emissions refers to releases of mercury to air (article 9) while releases refers to releases of mercury to water or land.

Much of the mercury released into the environment from ASGM activities enters directly into freshwater resources or into soil/sediment. Mercury in soil/sediment can be remobilized, ultimately reaching nearby streams, rivers, and lakes, where methylation can occur, contaminating aquatic life that may be a food source for local communities.

Some measures can be taken immediately to reduce mercury releases into water bodies and onto land:

➔ **Management of tailings:** Unmanaged tailings containing mercury represent a diffuse but constant source of mercury releases into the environment. Mercury-contaminated tailings should never be directly discharged into a water body or in places susceptible to flooding. Disposal of mercury-contaminated tailings must be done according to a suitable standard that includes linings, depth, distance from water bodies, sizing, impoundment structures, covering, revegetation, etc. One example of such a standard is listed in UNIDO (2008), and includes recommendations to: place tailings on a clay or laterite soil-lined pit of several meters depth; locate at least 100 meters away from any water body; when the pit is full, cover it with 1 meter of clay or laterite, then compact, cover with soil, and re-vegetate. Important variables that bear on the stability of tailings storage facilities include climate, hydrologic settling, earthquake and landslide hazards, and underlying geology.

It is also important to take measures to warn the public about the presence of mercury-contaminated tailings. Signage may be erected to indicate the hazard present at the site and fencing erected to deter access by people, livestock and wildlife and minimize their exposure to mercury vapor. Governments may consider recording the coordinates of mercury-contaminated tailings sites for future protective and/or remedial actions.

➔ **Contained amalgamation:** When and where amalgamation is still practiced, an amalgamation zone should be created that is contained, controlled, centralized, and distant from sensitive ecological and human receptors. For example UNIDO (2008) recommends that no person should conduct amalgamation within a distance of at least 100 meters from any natural water body, including rivers, streams, lakes, and other water bodies. (Countries may want to exercise caution and consider longer distances.) Amalgamation should be conducted in a water-tight amalgamation barrel (UNIDO 2008).

➔ **Mercury storage:** The protocols for environmentally sound storage of mercury should be created to prevent spills. For example, mercury should be stored in resilient vessels with a small amount of water on top to minimize evaporation and, where possible, stored on an impervious surface. The cap should be tightened and tape should secure the cap to the bottle. A proper label should mark the bottle as mercury and as toxic. Mercury should be kept in a secure location, inaccessible to children, and never stored in a residence (UNIDO, 2008).

- ➔ **Mercury capture and recycling:** Burning gold amalgam releases mercury into the air; technologies such as retorts or other mercury capture devices reduce these releases and, consistent with a country's elimination of worst practices, may be promoted for use by miners, in gold shops, and in gold processing centers. Mercury can be recovered from these devices for recycling. However, after its first use, mercury recovered from these devices is less effective because it has become contaminated. An effective method for cleaning and activating mercury uses a simple solution of table salt or caustic soda (sodium hydroxide) and a battery. The result is cleaner mercury that amalgamates gold more effectively, and lowers mercury use and releases into the environment. UNEP (2012a) contains a detailed description of this process.
- ➔ **Contaminated sites:** The use of mercury in ASGM, both current and historic, can produce sites where soil, sediment, or other media are contaminated with mercury. Such sites can lead to ongoing releases of mercury into the environment. In the Minamata Convention, the identification, assessment, and remediation of contaminated sites from any source is covered in Article 12, which calls on the COP to create guidance on the management of mercury-contaminated sites. Governments may refer to that guidance in addressing sites contaminated by ASGM activity.

#### **Long term strategies for the reduction and elimination of the use of mercury**

Ultimately the most effective way to reduce emissions, releases and exposures is to reduce and, where feasible, eliminate the use of mercury in ASGM, by transitioning miners to mercury-free techniques, and where this is not feasible, to lower-mercury concentrate-amalgamation

- ➔ **Concentrate-amalgamation** occurs when miners first concentrate the gold in the ore, resulting in a much smaller mass to which mercury is applied. Gravity is a common method of concentration, because gold is much heavier than other minerals. Concentration can occur with relatively simple pieces of equipment (e.g., traditional panning or sluice boxes) or more advanced technologies that may include shaker tables, centrifuges, and/or jig concentrators. This method works best when gold is adequately liberated naturally or by proper milling and grain size sorting.
- ➔ **Partial amalgamation** is a term used when miners first extract the easily separated gold before amalgamation, for example by panning or using a shaking table to separate the coarse fraction. This can greatly reduce the amount of mercury used because it is applied to a lesser amount of gold. It also has the advantage of producing a stream of mercury-free gold that may have marketing advantages and further accelerate the transition to completely mercury-free production.

#### **Mercury free techniques include:**

- ➔ **Gravity-only concentration with direct smelting:** In some cases, gravity concentration alone may be sufficient to create a high concentration ore that can then be directly smelted. For concentrates greater than 25% gold, the gold can be extracted from the other minerals by heating it with a compound (a flux like borax or lithium) that lowers the melting point of the other minerals allowing the gold to coalesce. An added benefit is that direct smelting can in some cases extract unliberated

gold from other minerals and increase overall recovery – an economic incentive. This is typically true mainly for hard rock deposits. Under field conditions direct smelting can typically only be performed on masses less than 100 grams, and thus is not suitable for low concentration, higher volume concentrates.

The combination of concentration and direct smelting is a good alternative to mercury use. However, the level of concentration required is high and therefore can lead to gold loss to the tailings. When promoting this technique, care should be taken to recognize the possible loss of gold to tailings and to implement practices which minimize or eliminate this potential reduction in gold production.

#### What is the “borax” method?

The “borax method” is a short-hand term for a range of methods to improve the concentration of gold in ore without using mercury, so that the ore can be directly smelted (with borax or another flux). Borax does not replace mercury directly in gold extraction process. It is used at a different stage of the process, that is, during smelting. Nor is it always a mercury-free process as miners often use borax in conjunction with mercury. In order to be able to directly smelt gold ore using borax, the concentration in the ore must be around 25% or greater. To create such high grade material improved concentration methods must be applied. These improved concentration methods (and the subsequent use of borax) do not represent a simple one-to-one replacement of mercury for another chemical, but usually require new or improved processing techniques, and will generally require training and assistance to promote their adoption.

- ➔ **Chemical leaching.** To recover gold that may have been lost to the tailings in the concentration process, chemical leaching of various types can be employed. An integrated milling-gravity-leaching system may be used where coarse gold is captured by gravity concentration and the rest by leaching. The dominant chemical leaching method uses cyanide. While cyanide and mercury are both toxic substances, cyanide is a degradable compound that can be destroyed and is not persistent in the environment. Cyanide can obtain very high recovery rates - often 90% of the gold in the ore. Because of this, the use of cyanide has become increasingly adopted by ASGM. Unfortunately, cyanide and other leaching chemicals are very hazardous and in ASGM have caused severe local pollution and therefore these practices are only suitable for organized and trained miners that can comply with chemical management protocols.
- ➔ **Magnetic Separation:** Simple mineral separation techniques such as magnets to remove iron-bearing minerals can help upgrade mineral concentrates to a level that can be directly smelted. Most mineral deposits, both hard rock and alluvial, contain some magnetic minerals (primarily magnetite). These minerals are very dense and can account for a relatively large percentage of gold concentrate. They can be removed with a simple magnet before amalgamation or direct smelting, thus further upgrading the concentrate.



➔ **Flotation:** is a process that uses the different chemical properties of mineral surfaces to create a concentrate. Bubbles (froth) are made with soap or another chemical in an ore “pulp” (made from finely ground ore and water). The surface properties of gold and sulfide particles cause them to attach to the bubbles as they rise through the pulp, separating these particles from the other minerals in the ore, like quartz. The bubbles make a froth that collects at the top of the tank. The froth is skimmed off and dried to form a concentrate that can then be further processed locally or sold to other processors.

Countries may consider strategies to demonstrate these better practices, and create an outreach program to miners to disseminate information about these practices, as discussed in Chapter 5.10. Countries may also consider other supportive strategies, such as convening miners and equipment distributors, and connecting miners to engineering technical assistance through schools of mines. Additional information on developing successful training workshops and other communication strategies can also be found in UNIDO’s training manual (UNIDO 2006).

## 5.6 Managing Trade of Mercury and Mercury Compounds and Preventing Diversion for Use in ASGM

### Sample Actions:

- Investigate how mercury enters into the country and is traded at ASGM sites;
- Review adequacy of local laws affecting mercury trade in ASGM;
- Enact domestic laws consistent with Minamata Convention obligations;
- Develop country import consent process;
- Develop licensing schemes and manifests that tracks mercury flows in the country;
- Initiate a coordination mechanism on trade with other countries;
- Develop module for training customs officials on mercury.

Annex C, Paragraph 1(f) requires the NAP to include “Strategies for managing trade and the prevention of diversion of mercury and mercury compounds from both foreign and domestic sources to use in ASGM and processing”<sup>11</sup>.

<sup>11</sup> The Minamata Convention defines the term “mercury compound” as “any substance consisting of atoms of mercury and one or more atoms of other chemical elements that can be separated into different components only by chemical reactions.” (Article 2(e)).

## 5.6 (a) Mercury supply, trade and ASGM under the Minamata Convention

Article 3 of the Convention (mercury supply sources and trade) contains several provisions that are relevant to ASGM. Article 3 prohibits mercury supply originating from primary mercury mining and excess mercury from the decommissioning of chlor-alkali plants from use in ASGM<sup>12</sup>. Therefore, Parties have an obligation under the Convention to prevent these sources from being used in ASGM.

Under Article 3 Paragraph 6, trade of mercury is permitted only for a “use allowed” by the Convention. A “use allowed” is defined in Article 2 as any use of mercury consistent with the Convention. However, this does not mean that mercury use in ASGM is automatically allowed in every country without restriction. In fact, in many countries mercury use in ASGM is restricted or not allowed at all under domestic law.

Moreover, mercury use that is inconsistent with a Party’s Nation Action Plan (if it is required to develop one) would not be consistent with the Convention, and therefore would not be considered a “use allowed” for the purposes of Article 3. Therefore, mercury imports must be consistent with the measures and reduction targets specified in the NAP to be considered a “use allowed”.

Under Article 3 Paragraph 6, an exporting country must obtain the written consent of the importing country prior to authorizing the export. Such consent would not be expected where the proposed mercury use in ASGM is inconsistent with the National Action Plan or violates domestic law. Therefore, for this section of the NAP, countries must include strategies to manage trade and prevent diversion of mercury to ASGM that are consistent with (1) Article 7 obligations, including NAP measures and reductions targets, and (2) Article 3 obligations, including those that prohibit the use of mercury from primary mining and excess mercury from the decommissioned chlor-alkali plants in ASGM. Strategies will also need to take into account domestic laws and the informed consent trade provisions of Article 3.

## 5.6 (b) Strategies for managing trade

Annex C Paragraph 1(f) requires that the NAP must contain strategies for managing trade. When countries are developing their trade strategies, they may wish to consider the following questions:

- What procedures are needed to ensure that the intended use of imported mercury is documented, tracked and verified?
- What information should the exporter provide to the country of import, to verify that the mercury is not from a prohibited source?

<sup>12</sup> Article 3, Paragraphs 4 and 5(b).

- What evaluation criteria and procedures should be used to evaluate whether mercury imports for use in ASGM should be allowed under Article 3 consent provisions?<sup>13</sup> The evaluation procedures should include mechanisms for determining whether the imports are consistent with Article 7, the NAP measures and targets, as well as mechanisms for ensuring that the imports do not originate from prohibited supply sources.
- Under what circumstances will mercury import consent be granted or denied?

As a first step, countries may consider setting up a special working group of the relevant authorities (environment, trade, mining, commerce, and customs, and local authorities, for example) that will be involved in implementing the strategies.

To develop strategies, countries may consider the following steps:

- Reviewing domestic laws and regulations regarding mercury, including its domestic use and treatment, as well as its trade internationally. This review will identify inconsistencies or gaps with the Convention and any other relevant international environmental agreements.
- Inventorying “pressure points” or other factors that will affect mercury trade. These could include other existing domestic uses for mercury supply, such as use of dental amalgam, or manufacture of other mercury containing products such as certain lamps, which could affect the need for trade. Other pressure points could include decommissioning of chlor-alkali plants or active primary mining in the region, as these are mercury supplies that should be monitored carefully to ensure they do not enter ASGM.
- Researching volumes and pathways of mercury trade flows across borders and within the country’s territory<sup>14</sup>. Countries may consult the United Nations Statistical Division – Commercial Trade, otherwise known as COMTRADE, which maintains an online data base, for basic data on trade flows<sup>15</sup>. Using the commodity code for mercury (280540) and other relevant codes, data on large mercury exporters and mercury flows to the region can be obtained. For a particular country it may be useful to compare the COMTRADE data listing that country as a ‘destination’ for mercury against the official domestic import data (customs) for that country. If the former data volumes exceeds the latter there is a significant possibility that the balance has been imported illegally.

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<sup>13</sup> The COP will be developing guidance and forms to be used for exports and imports of mercury, and each government will designate a focal point for receipt of these trade-related materials as required by Paragraph 4 of Article 17.

<sup>14</sup> One example of a trade investigation using these sources of information was conducted by the NGO Ban Toxics covering mercury trade into the Philippines. See [http://www.bantoxics.org/sites/default/files/resources-attachments/Mercury%20Flow\\_Trade.pdf](http://www.bantoxics.org/sites/default/files/resources-attachments/Mercury%20Flow_Trade.pdf).

<sup>15</sup> <http://comtrade.un.org/db/default.aspx>.

- Researching sources of illegal mercury imports, including the existing or likely mercury entry points into the country, and the distribution networks within the country<sup>16</sup>. As part of this research, countries may wish to investigate whether various illegal goods follow the same smuggling routes as mercury. INTERPOL and the Secretariat of the Basel, Stockholm, and Rotterdam Conventions have prepared an e-learning module for law enforcement officials about controlling trade in hazardous substances<sup>17</sup>. Governments may find the materials in the learning module useful for this purpose. Also potentially useful in defining possible elements of a strategy to prevent illegal mercury trade is a Toolkit prepared to combat Wildlife and Forest Crime by the International Consortium on Combating Wildlife Crime<sup>18</sup>.

The resulting strategies developed may include:

- Coordination and training of trade officials on the requirements of Article 3, and on ways to prevent illegal shipments from entering the country,
- Coordination with neighboring countries to, as appropriate, develop harmonized trade and tax regimes and cooperation on enforcement, including preventing or minimizing illegal mercury trade.
- Extension of the mercury inventory report and database to include a mass balance of mercury within the country covering all mercury sources.

### 5.6 (c) Strategies for preventing diversion of mercury to ASGM

Annex C Paragraph 1(f) also requires that the NAP include strategies for preventing diversion of mercury from foreign and domestic sources to ASGM. To better track the legal trade of mercury within the country, and to prevent diversion, countries may consider:

- Developing licensing requirements for mercury traders and/or large mercury sales. The licensing requirement could require prior approval of domestic imports or sales of mercury, so the government could ensure the imports will not be illegally diverted to ASGM. The licensing requirement could also be used to track and manage the quantities and locations for mercury use in ASGM, in accordance with the reduction targets in the NAP.
- A point of sale register could be developed for all domestic mercury transactions recording the identification of the seller and purchaser including the volume of mercury transacted, the location and the date. This type of system applies to transactions involving gold in some

<sup>16</sup> Where the legal status of the trade of mercury trade in ASGM is in flux, countries may wish to consider policy instruments, such as temporary amnesty approaches, in order to obtain better information and/or engage the sector directly without supporting illegal activities.

<sup>17</sup> <http://synergies.pops.int/Default.aspx?tabid=3534>.

<sup>18</sup> [http://www.cites.org/common/resources/pub/ICCWC\\_Toolkit\\_v2\\_english.pdf](http://www.cites.org/common/resources/pub/ICCWC_Toolkit_v2_english.pdf).

countries to restrict illegal trade in the commodity. The register would have an additional benefit in allowing data verification and thorough analysis of the mercury trade in a given country.

- Developing manifest requirements for mercury transport<sup>19</sup>. Manifests are often required for hazardous waste transport<sup>20</sup>. Such manifests could be designed so that the seller, transporter, and destination facility are required to complete and sign the manifest and provide a copy to the government, and thereby ensure each mercury shipment arrives at the appropriate destination facility and is not illegally diverted for use in ASGM. Shipments could be tracked electronically as well, through the use of bar codes and/or global positioning system devices.

If a country has primary mercury mining or mercury cell chlor-alkali plants within its borders, the NAP should also include strategies to prevent the diversion of these domestic mercury sources to use in ASGM to the extent prohibited by Article 3. In addition to the licensing and manifest procedures listed above, such measures may include legal restrictions on the sale of mercury from these sources and/or additional management requirements imposed on excess mercury from decommissioning chlor-alkali plants and mercury from primary mines.

## 5.7 Strategy for Involving Stakeholders in the Implementation and Continuing Development of the National Action Plan

### Sample Actions:

- Identify key non-government actors that are familiar with ASGM activities;
- Provide incentives for stakeholders to participate in consultation sessions;
- Engage leaders at the community level;
- Hold consultation meetings in or nearby communities affected by mining and processing;
- Establish and maintain a communication schedule between all stakeholders

Annex C Paragraph 1 (g) requires that the NAP include “strategies for involving stakeholders in the implementation and continuing development of the national action plan”. In order for the NAP to be effective at meeting its goals, all relevant stakeholders should be involved in its design *and* implementation. Chapter 4.1 describes the importance of including stakeholders in the initial development of the NAP. Key stakeholders should also be engaged in the implementation process. Having stakeholders involved from development through implementation will help to instill a sense

<sup>19</sup> Manifests are shipping papers that can be required to accompany the domestic transfer of mercury.

<sup>20</sup> A copy of a manifest used for hazardous waste shipments in the USA can be found at <http://www.epa.gov/osw/hazard/transportation/manifest/pdf/newform.pdf>.

of ownership of the process, making it easier to implement the changes proposed in the NAP.

While the term “stakeholder” is not defined in the Convention, the term can include multiple relevant ministries in the government (e.g., environment, mining, health, labor) as well as their local government counterparts, small-scale miners or associations that represent their interests, NGOs, large-scale mining interests, health specialists and providers, gold buyers, academia, and others. In particular miners and mining community members have a personal connection to the issues and understand the intricacies of how ASGM functions in reality. Incorporating their knowledge into the structure of the NAP will ensure that the project objectives are feasible and will increase the likelihood that community members are willing to participate in its implementation. Local government, local health service providers, community-based organizations, and other stakeholders are also likely to be important partners in the on-the-ground implementation of programs related to the NAP, and thus should contribute to its design and implementation plan from the outset, to ensure the plan is practical and feasible. The role of the large-scale mining sector as a stakeholder should also be strongly considered for technical guidance and also as it relates to land use conflicts and access the mining areas.

#### **Miner participation**

In most areas of the world, mining communities are often geographically removed from the central governing bodies. This is simply a function of where mineral resources naturally occur. Additionally, most of these communities are not tightly connected to the urban social structure and do not recognize or utilize the avenues or means of communication often employed by government campaigns.

Further, in many jurisdictions miners are operating illegally. In this case, their illegal status may make it difficult for governments to engage them and vice versa. Nevertheless, meaningful and effective engagement / involvement with small-scale miners will enhance the likelihood that the chosen strategies will work on the ground in the mining communities. Governments should consider how to overcome this obstacle and find avenues of dialogue with miners. Miner participation in the development and implementation of the NAP will help to ensure its long-term success.

Having key stakeholders involved and invested in the implementation and continued development of the NAP will help to ensure its long-term success. Mechanisms for doing this will need to be country-specific and will be something that the working group and its stakeholder advisory group can decide on collectively. There is no single approach but some ideas and approaches to consider include:

- Provide a neutral space as the venue for consultations;
- Be transparent with the process and sharing information;

- Provide logistical or financial support for miners and other critical stakeholders to participate in consultation sessions;
- Hold consultation meetings in or nearby mining communities;
- Engage stakeholders at the community level either by inviting community leaders and elders, health service providers, processing plant owners, and other entities in the gold mining supply chain in the community to meetings, or having national representatives attend community consultation meetings;
- Seek out under-represented groups (women, youth, impacted communities, etc.) to participate in consultations;
- Ensure that associations or entities representing a stakeholder or set of stakeholders are active and legitimately hold the interest of the particular sector they represent.

## 5.8 Public Health Strategy

Annex C Paragraph 1(h) requires that the NAP include “a public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury.” Individuals in or near ASGM communities can be exposed directly to mercury vapor produced during the burning of amalgam, or can be indirectly exposed to methyl-mercury in fish caught downstream of ASGM sites. The main effects of concern include neurological, kidney, cardiovascular and immune system effects. Individuals who perform the amalgam burn have been found to have very high levels of mercury in urine, at levels associated with kidney and neurological effects, and others living in these communities have also been reported to have high levels in urine (WHO, 2013). Studies looking at people living downstream of ASGM sites have been found to have elevated hair mercury concentrations, and neurological effects have been reported in these fish consumers as well (WHO, 2013).

### Other Resources:

At the request of the Chair of the 6<sup>th</sup> meeting of the INC, and as called for in the May 2015 World Health Assembly Resolution on the role of Public Health Ministries and Secretariat in Supporting the Implementation of the Minamata Convention on Mercury, the World Health Organization (WHO) is currently developing recommendations for a public health strategy on ASGM. The NAP guidelines will be updated when the WHO recommendations are released.

Annex C Paragraph (h) further indicates that public health strategies to address these impacts “should include, inter alia, the gathering of health data, training for health-care workers and awareness-raising through health facilities.” Note that UNIDO, under its Global Mercury Project, published protocols for environmental and health data collection (UNIDO, 2004).

Important factors to consider when developing a public health strategy for ASGM include:

- The gathering of health data is not necessarily limited to health data related to mercury, but should evaluate the public health status of the community generally. Taking an integrated public health approach may also open opportunities for harnessing shared resources (human, technical, financial) that can be used for both data collection and for any follow up actions needed.
- Training may be necessary for health care workers because they are often unaware of the effects of mercury and unable to recognize, diagnose and treat mercury poisoning.
- Health systems should have treatment protocols in place for mercury-related health effects, including exposure to mercury in ASGM.
- Existing health care structures that are already integrated into and trusted by communities can provide a readily-available platform for awareness-raising about mercury and its dangers.
- Significant mercury exposure can be assumed in many cases due to the way mercury is used and managed at these sites. Actions necessary to protect public health should not necessarily be delayed because of a lack of site-specific exposure data.
- Effective intersectoral engagement, between health and other relevant ministries and agencies, is essential for ensuring the effective implementation of measures to address the public health impacts of exposure to mercury in ASGM. It is similarly essential for ensuring that health issues are appropriately addressed as part of measures taken in other non-health areas.



## 5.9 Preventing Exposure of Vulnerable Populations to Mercury Used in Artisanal and Small-scale Gold Mining

### Other Resources:

The World Health Organization is currently developing recommendations for preventing exposure of vulnerable populations. The NAP guidelines will be updated when the WHO recommendations are released.

Annex C, Paragraph (i) requires countries to include in the NAP “strategies to prevent the exposure of vulnerable populations, particularly children and women of child-bearing age, especially pregnant women, to mercury used in artisanal and small-scale gold mining”. Vulnerable populations may also include those that rely heavily on eating fish that may be contaminated by ASGM activities.

Children are often engaged on ASGM sites and the use of child labor is a sensitive and important issue in ASGM. The International Labor Organization estimates that about one million children aged 5 to 17 are engaged in small-scale mining and quarrying activities worldwide (this figure includes all kinds of mining, not just gold mining using mercury)<sup>21</sup>. There is also evidence that children are involved in performing both amalgamation and burning of amalgam, putting them at a high risk of mercury exposure (Bose-O’Reilly et al. 2008; HRW 2011, 2013; Kippenberg 2014). Thus, strategies to prevent exposure of children to mercury should also consider strategies to eliminate child labor practices in ASGM. In addition, mercury levels in air can be elevated in communities, including in towns and cities where mercury amalgam is traded and processed, and where the local population, including children, can become exposed to unsafe levels of mercury.

Under the international ILO Convention 182 on the Worst Forms of Child Labor (C182), which has been ratified by 179 countries, the worst forms of child labor are prohibited for anyone under the age of 18. These include forms of child labor that expose children to hazardous substances and are likely to harm a child’s health. Many countries have national legislation that prohibits hazardous child labor for anyone under the age of 18. Therefore, the NAP has a critical role to play in reducing children’s work with mercury. Useful strategies to reach this objective could include:

- Targeted outreach and awareness-raising on the risks of children’s work with mercury in ASGM communities—including with community leaders, parents and children;
- Implementation of environmental and mining regulations prohibiting the use of mercury (or child labor in mining) by children, including through penalties against employers;

<sup>21</sup> See at: [http://www.ilo.org/global/publications/magazines-and-journals/world-of-work-magazine/articles/WCMS\\_081364/lang-en/index.htm](http://www.ilo.org/global/publications/magazines-and-journals/world-of-work-magazine/articles/WCMS_081364/lang-en/index.htm).

- Inspections for children’s use of or exposure to mercury by government officials such as mining inspectors, environmental inspectors, and labor inspectors;
- Mainstreaming of child labor issues into ASGM programs and information-sharing on child labor with relevant government and UN agencies.

Another, related problem is the exposure of children who are not working, but who are present at ASGM sites because their mothers lack child care, and the exposure of the fetus during pregnancy. The NAP may address this issue by ensuring that:

- There is targeted outreach and awareness-raising on the risks of mercury exposure for the fetus and the child in ASGM communities—including with community leaders and women—on the issue of children’s use of mercury;
- Non-government actors working on ASGM include the issue of children’s mercury exposure into their programs and share information on child labor with relevant government and UN agencies;
- The ministries of education and family are made aware of the need to early childhood institutions in ASGM areas.

The World Health Assembly resolution on the role of WHO and ministries of public health in the implementation of the Minamata Convention<sup>22</sup>. calls on Member States to, among other things, “promote appropriate health care services for prevention, treatment and care for populations affected by the exposure to mercury or mercury compounds, including effective risk communication strategies targeted at vulnerable groups, such as children and women of childbearing age, especially pregnant women.” It is anticipated that WHO will include guidance on developing strategies to prevent exposures to such vulnerable populations as part of its public health strategy guidance, and countries are advised to consult that guidance when it is issued. This guidance document will be updated to reflect that information as it becomes available.

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<sup>22</sup> See [http://apps.who.int/gb/ebwha/pdf\\_files/WHA67/A67\\_R11-en.pdf?ua=1](http://apps.who.int/gb/ebwha/pdf_files/WHA67/A67_R11-en.pdf?ua=1)

## 5.10 Strategies for Providing Information to Artisanal and Small-scale Miners, Gold Processors, and Affected Communities

### Suggested Actions:

- Develop an outreach plan specific for affected communities;
- Establish miner training programs for reduced- and –zero-mercury mining practices;
- Identify appropriate means of communication for delivering messages to miners, gold processors, and community members;
- Establish linkages between other on-going development activities

Communicating with miners and affected communities about issues related to mercury and ASGM requires detailed knowledge of the socio-cultural, economic and institutional context. This is often site-specific, particularly in regions and countries where migration patterns have brought people from multiple cultural backgrounds together. The skills and techniques needed are similar to those mentioned in Chapter 4.4(b), including:

- Outlining goals of the outreach;
- Identifying target audiences(s);
- Defining the central message(s) to be communicated;
- Considering appropriate types of media and other techniques for engaging the target audience;
- Providing a means of evaluating the effectiveness of the communication

However, direct communications with miners and affected communities may require a more nuanced approach that is designed to inform people but also change behaviors.

Within the context of the Minamata Convention and the NAP process, communication goals will vary by country and will evolve throughout the NAP process. Initial outreach efforts may focus on providing information to communities to raise overall awareness of mercury issues and of the goals of the Minamata Convention itself, whereas subsequent outreach may address specific aspects related to public health, appropriate mining techniques, changes related to legislation and regulation, or other aspects of formalization, alternative livelihoods, and/or natural resource management issues. Further, countries may choose to use interactions with miners and affected communities to cover a wider range of health, social and economic topics that are relevant to these

communities. For example, a health communication program could provide information about improving overall hygiene and sanitation, as well as provide important messages about preventing mercury exposures (Artisanal Gold Council, 2014).

Providing information to miners and affected communities will benefit from a carefully crafted communication plan or strategy. A communication plan is the process of determining what media (e.g., print, radio, TV, mobile phones and social media), as well as other techniques (e.g., workshops, training sessions, public debate, art contest, fairs/ festivals or other community events etc.), are best suited in delivering the message to these communities, and who will be the most credible messengers, considering their social and cultural conditions. The use of existing social networks may be one of the least expensive and most effective ways to transmit information about mercury. Such networks can be used in a variety of ways:

- speakers can visit schools, and materials can be developed for students that they can then take home to their parents;
- Religious leaders can be enlisted to help with communications, as their advice is generally respected;
- community-based organizations whose charter includes the dissemination of public health information and/or community economic development can deliver programs. Community-based organizations often communicate regularly with other groups with similar goals.

Efforts should be made to engage with other conservation and development efforts being conducted in mining areas to ensure that programs work in concert with one another and take advantage of available resources.

A significant hurdle when communicating with miners and others about the potential human health and environmental impacts of mercury contamination is that impacts are often not immediately visible. The pathways of exposure to mercury are complex and responses in humans can range from observable neurological problems (such as tremors) to cardiovascular problems, where effects are more subtle. In addition, the ecosystem response to mercury contamination can vary depending on multiple biotic and abiotic factors. The communication challenge is to distill these complex topics into compelling messages that are easily understood and related to by the target audiences.

Names, locations, and contact address of the doctors and hospitals that can provide adequate diagnosis and treatment to those who are already affected by the toxicity of mercury is also important information for victims of the mercury poisoning.

In addition to the need to provide information on human and ecosystem health impacts related to mercury, there will likely be a need to provide education and training activities designed specifically for miners and gold processors on techniques for minimizing exposures as well as techniques for

mercury-free and low-mercury gold production. Training workshops can provide miners with information about improvements in the crushing and milling of ore, simple as well as more technologically advanced methods for concentrating the ore and removing non-target minerals, and/or better management practices that create a safer more productive mine site. Direct miner to miner training is one approach that has been particularly successful, as miners have significant credibility with their peers. Gold processors can be trained in the use of technologies to reduce emissions of mercury.

UNIDO has developed the Manual for Training Artisanal and Small-Scale Gold Miners that provides extensive information on how to conduct miner training workshops, including who should be involved and the type of curriculum that should be presented (UNIDO, 2006). Argonne National Laboratories and U.S. EPA have provided training for gold shop owners on the use of a mercury capture system (Argonne National Laboratories, 2013).

**Miner Training Workshops (from UNIDO 2006):**

A successful training workshop should incorporate the following concepts:

- Focus on singular concepts, such as miner health and safety or improved gold recovery – too broad a focus will make it difficult to get your message across
- Incorporate multiple teaching strategies to communicate similar ideas and concepts (e.g., small discussion groups, simulations, use of new safety equipment and mining equipment, videos and other media, role playing, etc.
- Address social pressures related to poor practices (e.g., the use of protective wear)
- Reinforce common values (e.g., the health and safety of children)
- Provide experience with new technologies in order to practice new skills
- Develop a system to train trainers from the local community

## 5.11 Schedule for Implementation of the National Action Plan

### Suggested Actions:

- Identify timeline for the major goals and tasks associated with those goals;
- Conduct regularly scheduled reviews of the implementation activities to ensure that they are being completed.

A schedule for implementing the NAP involves turning the goals and objectives outlined in the chapters above into specific tasks and activities (see Section 4.4). The schedule that is developed in the NAP should include a timeline of when each phase or step will be implemented and accomplished as well as the government agency, organization or other stakeholder group that is responsible for implementing the activity. It is possible to also break down the timeline of activities into smaller increments that will facilitate easier tracking of progress.

When developing the schedule for the implementation of the NAP, it may be helpful to rely on stakeholder groups who have extensive experience with specific actions. This way, the NAP will better utilize the strengths of the broader stakeholder group to facilitate, implement, and review the progress achieved. Detailed scheduling of activities for the implementation of the NAP can be supported by establishing interim goals or subtasks. These interim goals should be thought of as 'what needs to be accomplished in order to conduct the activity'. As for each task and activity, economic, social, and environmental factors should be considered.

### Schedule for Implementation

Under the Minamata Convention, governments with more than insignificant ASGM are required to submit their NAP within three years of the Convention entering into force. Subsequent progress reports are required every three years. Therefore, the initial schedule for implementation of the NAP should incorporate the three year review and reporting obligation.

The implementation schedule should also include information about the criteria that will be used to determine if goals and objectives are being achieved. These criteria can be a combination of qualitative and quantitative measures; the important consideration is that they are easily communicated to the various stakeholders. These criteria should serve as an evaluation tool as well. If criteria are not being met within a reasonable time table, it may be necessary to reconsider the implementation approach.



# 6 Market-based Mechanisms for Promoting Reduced Mercury Use within the ASGM Sector

## 6. Mechanisms for Promoting the Market for Mercury-free Gold

Annex C Paragraph 2 of the Convention states that a country may include additional strategies in its NAP to achieve its objectives, including “the use or introduction of standards for mercury-free artisanal and small-scale gold mining and market based mechanisms or marketing tools.”

There is an emerging global market built around increased interest in buying/ selling mercury-free or reduced-mercury gold. There may be certain market segments (e.g., jewelers whose market position relies on more sustainable inputs) where buyers are willing to pay a premium for mercury-free gold that meets a certifiable standard. Standards and other market-based mechanisms can provide incentives to miners to transition away from mercury use and/or specific bad practices, and to transition toward more environmentally and socially sustainable practices.

Standards and other market-based mechanisms generally have two elements: some kind of verification or certification process to ensure the supplier uses mercury-free (or in some cases, mercury-reduced) methods; and supply chain traceability and transparency. Descriptions and examples of gold standards and mechanisms are included below.

- **ASGM gold standard.** Standards for mercury-free gold production generally will require a certification process to ensure that the supplier uses mercury-free methods. The process of certification provides an opportunity for engagement with mining communities who want to obtain certification of compliance with the standard. Participation in the certification scheme encourages miners to operate in the formal economy and develop long-term business relations with their commercial partners. Because a standard can also include social and labor requirements, miners may also benefit from better working conditions.
- **Due Diligence Requirements.** Due diligence initiatives require gold buyers to try to obtain gold from suppliers that meet certain criteria, in particular suppliers that abide by laws and requirements related to ASGM gold production. For example, the Dodd-Frank Act<sup>23</sup> in the United States requires U.S. companies to disclose if they source gold, tin, tantalum or tungsten from affected countries in the African Great Lakes Region and if the minerals contribute to conflict. Further, the Organization for Economic Cooperation and Development (OECD)<sup>24</sup> has developed a due diligence guidance for responsible supply chains for minerals from “conflict-affected or high-risk areas.” The OECD guidance includes an Appendix on ASGM, which suggests that stakeholders support formalization and legalization, and help miners create verifiable supply chains. As countries develop more regulations and restrictions on mercury use in ASGM, these due diligence initiatives will influence gold buyers to ensure that their gold sources in supply chains become mercury reduced or mercury-free.

<sup>23</sup> <http://www.sec.gov/rules/final/2012/34-67716.pdf>

<sup>24</sup> <http://www.oecd.org/fr/daf/inv/mne/mining.htm>; <http://www.oecd.org/daf/inv/mne/GuidanceEdition2.pdf>



- **Voluntary market based mechanisms and marketing tools.** Voluntary initiatives have been developed to help miners improve production and reduce environmental impacts, and increase traceability, creating a supply of gold produced without mercury for the market. This type of initiative may contain components on better production, transparency and traceability, which are vital to getting and retaining access to markets for gold mined without mercury. This mechanism can also help create demand and links certified or certified willing producers with the market<sup>25</sup>.
- **Supply chain policies of retailers.** Some prominent retailers of gold have adopted their own sourcing policies that require good environmental practices in gold production. While these policies are generally directed at large scale mining, they can also be tailored to create markets for small scale gold producers. These programs can reward mercury-free extraction through preferred purchases and can also include training and education programs for artisanal miners, along with equipment and access to markets.
- **Development of local businesses to design and make distinctive jewelry is another way to increase wealth distribution in rural areas.**

### Socially responsible investment funds

Recent decades have seen the development and growth of investment instruments that focus investments in socially responsible companies. The socially responsible investment (SRI) market currently represents trillions<sup>26</sup> of dollars of investment. It is possible that the private sector could develop instruments that include producers of mercury-free artisanal gold in the SRI market.

Governments can encourage the development of market-based mechanisms by:

- Demonstrating rigorous implementation, monitoring and enforcement of the NAP and ability to ensure traceability and certification of practices;
- Offering encouragement to industrial scale mining companies to work with the ASGM sector on certification and supply chain traceability through tax incentives and other inducements;
- Convening stakeholders to discuss development of a market-based mechanism, such as at regional mining conferences;
- Offering tax incentives for the ASGM sector to participate in a certification process;
- In countries where gold is purchased by a national government entity, countries may consider special programs for purchase from artisanal and small scale miners who meet certain criteria for mercury-free gold production.

<sup>25</sup> For example, see <http://www.seco-cooperation.admin.ch/themen/05404/05405/05406/05411/index.html?lang=en>

<sup>26</sup> <http://www.triplepundit.com/2012/11/total-sri-assets-374-trillion-enough-move-needle/>

To be successful, these mechanisms often require strong and sustained intervention; independent verification and certification; and ongoing monitoring. This kind of intervention can be challenging and time consuming to implement at a large scale. In the NAP process, countries may choose to focus first on the highest priorities of basic compliance assistance and formalization, while evaluating where market-based mechanisms can provide needed supplementary incentive for encouraging change<sup>27</sup>.

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<sup>27</sup> Other helpful references when considering market-based mechanisms can be found at: Cartier/Gold Lake: <http://www.cartier.com/maison/commitments/cartier-and-corporate-social-responsibility/resources-excellence/gold-12160>; The Sustainable Gold Initiative: [http://www.responsiblejewellery.com/files/RJC-Solidaridad-joint-Press-Release\\_21.06.20121.pdf](http://www.responsiblejewellery.com/files/RJC-Solidaridad-joint-Press-Release_21.06.20121.pdf)



# 7 Gender, Child Labor and ASGM



## 7. Gender, Child Labor and ASGM

In general, women play a much larger role in ASGM communities than in large-scale mining and in both sectors, no matter the capacity, they are critical to community stability and growth. Due to lack of research and documentation, it is difficult to determine the exact extent of women's involvement in ASGM over the years. However, a study completed in 2003 reported that among the more than 20 million ASGM and small-scale active miners, the proportion of women was estimated at 30 percent (Hinton et al., 2003).

Women's roles in ASGM vary between and within countries, depending on the proximity to villages or homes and the mineral being mined. Because of their traditional role as transporters and processors of materials, women are not often identified as miners. Their involvement is often invisible as they are usually found in the household; therefore there may be a significant discrepancy between the estimated and actual numbers of women involved in the ASGM. In Uganda both men and women work an average of 7-8 hours per day and women then work an additional 5-8 hours because of their domestic responsibilities.

The roles both women and men play can have different social, environmental and economic implications, these may have dangerous implications for women specifically. In communities where women and girls are the sole collectors of water, an ASGM activity that pollutes local water sources may force them to travel much further for water; this can be dangerous in some countries. In addition, a lack of law and order in some mining areas makes women more vulnerable to crimes and low income forces them into prostitution (Buxton 2013).

Because women are involved in processing and waste disposal this exposes them to harmful chemicals, with severe consequences for family well-being and health, including pregnancy. The risk of exposure during pregnancy, and consequently exposure of the fetus to mercury is also of significant risk within ASGM communities.

Child labor is closely linked to women's burdens (both at the mine and at home) and to their extreme poverty, lack of education and lack of control earnings. Unfortunately child labor is very common within the ASGM community. Children undertake arduous activities such as lifting, digging, ore haulage and transport. Children also work with mercury (Bose O'Reilly 2008: HRW 2011: HRW 2013: Kippenberg 2014). Ages range from as young as 6 to 9 and because of their smaller size they have easier access to tunnels. Children are also known to be involved in prostitution, drug and alcohol abuse and violence (Buxton 2013).

Under the international ILO Convention 182 on the Worst Forms of Child Labor (C182), which has been ratified by 179 countries, the worst forms of child labor are prohibited for anyone under the age of 18. These include forms of child labor that expose children to hazardous substances and are

likely to harm a child's health. Many countries have national legislation that prohibits hazardous child labor for anyone under the age of 18, including child labor in mining.

Addressing child labor in mining is a complex process. Long-term measures must address the underlying causes of child labor, in particular poverty at the household level and child neglect; successful measures have included, for example, stipends for school attendance and other social protection measures.

National Action Plans on ASGM can assist with addressing issues related to child exposure through several potential mechanisms. These might include:

- Targeted outreach and awareness-raising on the risks of children's work with mercury in ASGM communities;
- Implementation of mining regulations prohibiting the use of mercury (or child labor in mining) by children;
- Including child labor in ASGM as part of routine inspections of mining areas;
- Collaborating with the ministries of education and families as well as non-governmental actors to promote early childhood institutions in ASGM communities and to include outreach components that focus on child labor issues in current and future projects being conducted in ASGM communities.

It is important that more time is invested in understanding the division of labor that women, children and men play within the ASGM sector, as they all play key roles within their communities. Changes can be made to improve the local economy, government, household, but also and more importantly the safety of the individuals working within and around these communities.

## Key Resources and References Cited

### Key Resources

This section gives an overview of the key resources, which are organized in four categories: Technical aspects, Formalization and responsible gold certifications, Health, and Gender and Child labor. Following section “References Cited” contains further important publications.

#### Technical aspects

- UNEP’s “Practical Guide” provides an excellent overview of ASGM practices and provides a thorough discussion with examples of ways to reduce the reliance on mercury, including zero-mercury gold processing.

**UNEP. 2012a. A Practical Guide: Reducing Mercury Use in Artisanal and Small-scale Gold Mining.** United National Environment Programme. 76pp. Last accessed on 9/30/14.

[http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/Documents/ASGM/Techdoc/UNEP%20Tech%20Doc%20APRIL%202012\\_120608b\\_web.pdf](http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/Documents/ASGM/Techdoc/UNEP%20Tech%20Doc%20APRIL%202012_120608b_web.pdf)

- The UNIDO Global Mercury Project conducted extensive field work in several countries with ASGM and developed a manual for how to engage with miners and their communities about issues related to mercury use, new technologies for miners, and public health issues. The manual is a critical resource that should be consulted prior to any work in the ASGM sector.

**UNIDO. 2006. Manual for Training Artisanal and Small-scale Gold Miners.** Global Mercury Project, United Nations Industrial Development Organization (UNIDO), Vienna, Austria. 144pp. Last accessed on 9/30/14.

[http://www.communitymining.org/attachments/221\\_training%20manual%20for%20miners%20GMP%20Marcelo%20Veiga.pdf%3FphpMyAdmin=cde87b62947d46938306c1d6ab7a0420](http://www.communitymining.org/attachments/221_training%20manual%20for%20miners%20GMP%20Marcelo%20Veiga.pdf%3FphpMyAdmin=cde87b62947d46938306c1d6ab7a0420)

- UNIDO developed guidelines for mercury management that can assist governments in the development of new policies, legislation, and regulations. The guidelines cover a wide range of topics and provide what should be considered as minimum standards that can be part of a long-term strategy for the elimination of mercury.

**UNIDO. 2008. UNIDO Technical Guidelines on Mercury Management in Artisanal and Small-scale Gold Mining.** United Nations Industrial Development Organization 5pp. Last accessed on 9/30/14.

<http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/Documents/ASGM/UNIDO%20Guidelines%20on%20Mercury%20Management%20April08.pdf>

- **The International Cyanide Management Code** For the Manufacture, Transport, and Use of Cyanide In the Production of Gold (Code) is an industry voluntary program developed by UNEP and the then- International Council on Metals and the Environment (ICME). It promotes safe management of cyanide use in gold mining. For further information visit web site: <http://www.cyanidecode.org/>
- **The National Strategic Plan developed by the Philippines** was part of a Quick Start Programme through UNEP to test the 2011 Guidance Document for the development of national strategic plans on ASGM. The plan identifies and describes activities considered achievable for the phaseout of mercury use in ASGM. The document can be found here: <http://www.unep.org/chemicalsandwaste/Portals/9/2011-06-03%20NSP-ASGM.FINAL.2011.pdf> (Last accessed on 9/30/2014)

### Formalization and responsible gold certifications

- Formalization is a key factor enabling outreach on mercury management and other social concerns in ASGM communities. While formalization of the sector remains a significant challenge, the lack of formalization in ASGM is widely considered a barrier for miners in implementing change. UNEP's document on formalization approaches provides an excellent overview of different approaches.

**The ASGM Partnership website** contains extensive information on formalization including a summary analysis of case studies on formalization from five different countries: Ecuador, Mongolia, Peru, Tanzania, and Uganda. The summary document of these case studies was relied on for much of the information presented in the NAP Guidance Document. The website and associated links can be found at (last accessed on 9/30/14):<http://www.unep.org/chemicalsandwaste/Mercury/PrioritiesforAction/ArtisanalandSmallScaleGoldMining/FormalizationoftheASGMSector/tabid/79426/Default.aspx>

- **Swiss Agency for Development and Cooperation (SDC)** published a document on: *SDC experiences with Formalization and Responsible Environmental Practices in Artisanal and Small-scale Gold Mining in Latin America and Asia (Mongolia)*. Federal Department of Foreign Affairs (FDFA), Bern, Switzerland. 54 pp. (2011) Last accessed on 9/30/14. [https://www.eda.admin.ch/content/dam/deza/en/documents/Laender/resource\\_en\\_22306\\_5.pdf](https://www.eda.admin.ch/content/dam/deza/en/documents/Laender/resource_en_22306_5.pdf)
- **The Fairmined** Initiative was created by the Alliance for Responsible Mining (ARM) and it is a label that ensures the responsible practices in gold extraction within ASGM sector. For further information please refer to the web site: <http://www.fairmined.org/>
- **Responsible Jewelry Council** is a well-known standard and certification organization that promotes responsible practices and supply chain of the gold jewelry business. For further information please refer to the web site <http://www.responsiblejewellery.com/ric-standards-committee/>

## Health

- The following materials are available from the **World Health Organization**:
  - Guidance on identifying populations at risk from mercury exposure, jointly developed by WHO and UNEP in 2008. The document is available in English at:  
<http://www.who.int/foodsafety/publications/chem/mercuryexposure.pdf>
  - Factsheet on exposure pathways to mercury, corresponding health effects and possibilities to reduce human exposure from mercury sources. It is available in Chinese, English, French, Russian and Spanish at:  
<http://www.who.int/mediacentre/factsheets/fs361/en/>
  - In 2014, WHO commissioned a review of the literature regarding the health effects of mercury among those working and/or living near artisanal small-scale gold mining (ASGM) communities. The full scientific publication of this WHO-commissioned study is available at: *Environmental Health Perspectives*; DOI:10.1289/ehp.1307864  
<http://ehp.niehs.nih.gov/1307864/>
  - WHO is also developing a suite of materials on ASGM and public health which includes applications required under Article 7 of the Minamata Convention on Mercury. Included within are:
    - a) training materials for use in building health care provider capacity to identify and address environmental and occupational health issues associated with ASGM. Special focus is given to identifying, addressing and raising awareness about prevention and management of mercury exposure;
    - b) guidance on developing a national public health strategy on ASGM including in the context of the convention;
    - c) conducting a rapid health situation assessment in an ASGM community; and
    - d) good practice principles on the use of human bio-monitoring in an ASGM context.

The above described materials are expected to be released at the next INC meeting in Spring 2016.

- **The Artisanal Gold Council** (AGC), in collaboration with **UNIDO**, has developed a guide that can be used to provide training to health practitioners on health risks common in the artisanal and small scale gold mining sector.



**Artisanal Gold Council** (2014), Richard M., Moher P., and Telmer K.; **Health Issues in Artisanal and Small-Scale Gold Mining-** Beta Version 0.8, available online at: [www.artisanalgold.org](http://www.artisanalgold.org). (Last accessed on 9/30/14)

- **UNIDO** published a document *Protocols for Environmental and Health Assessment of Mercury Released by Artisanal and Small-scale Gold Miners*. United Nations Industrial Development Organization, Vienna, Austria. 294pp. (2004) Last accessed on 9/30/14. <http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/Documents/ASGM/PROTOCOL%20FOR%20ENVIRONMENTAL%20ASSESSMENT%20REVISION%2018-FINAL%20BOOK%20sb.pdf>

### Gender and child labor

- Researchers from the Oil, Gas and Mining Policy Unit (SEGOM) of the **World Bank** have published a document, intended to be used as a toolkit, which focuses on the complex levels of gender roles within the artisanal and small-scale mining communities. **Gender Dimensions of Artisanal and Small-Scale Mining: A Rapid Assessment Toolkit** gives a brief but thorough introduction to the topic of gender and ASM and then dives into the importance of such a tool-kit and how to use it during field assessments.
- **The US Department of Labor** has published the interactive tool: “Reducing Child Labor and Forced Labor: A Toolkit for Responsible Businesses” that can be used across sectors and industries to assisting in addressing child and forced labor throughout the supply chain. The document can be found here: <http://www.dol.gov/ilab/child-forced-labor/index.htm>.
- **ILO** (2007) document on: *Girls in mining*  
<http://www.ilo.org/public/portugue/region/eurpro/lisbon/pdf/girlsmining.pdf>.
- **PACT** (Poole, Hayes, and Kacapor) (2013) document on: *Breaking the chain: Ending the supply of child-mined minerals*  
<http://www.pactworld.org/sites/default/files/PACT%20Child%20Labor%20Report%20English%202013.pdf>
- **UNICEF** (2012) document on: *Children working in mines*  
[http://www.unicef.org/wcaro/english/Briefing\\_paper\\_No\\_4\\_-\\_children\\_working\\_in\\_mines\\_and\\_quarries.pdf](http://www.unicef.org/wcaro/english/Briefing_paper_No_4_-_children_working_in_mines_and_quarries.pdf)
- **The World Bank** (2012) document on: *Gender Dimensions of Artisanal and Small-Scale Mining: A Rapid Assessment Toolkit*.  
[http://siteresources.worldbank.org/INTEXTINDWOM/Resources/Gender\\_and\\_ASM\\_Toolkit.pdf](http://siteresources.worldbank.org/INTEXTINDWOM/Resources/Gender_and_ASM_Toolkit.pdf)

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**Argonne National Laboratory** (2013) *Manual for the construction of a mercury capture system for use in gold processing shops*. U.S. Environmental Protection Agency, Office of International and Tribal Affairs. 31 pp. Last accessed on 9/30/2014. [http://www2.epa.gov/sites/production/files/2014-07/documents/manual\\_for\\_mcs\\_construction\\_for\\_gold\\_shop\\_4-18-13\\_final\\_for\\_web\\_site\\_0.pdf](http://www2.epa.gov/sites/production/files/2014-07/documents/manual_for_mcs_construction_for_gold_shop_4-18-13_final_for_web_site_0.pdf)

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**Human Rights Watch - HRW** (2013) *Toxic toil. Child labor and mercury exposure in Tanzania's small-scale gold mines*. Last accessed on 9/30/14.  
[http://www.hrw.org/sites/default/files/reports/tanzania0813\\_ForUpload\\_0.pdf](http://www.hrw.org/sites/default/files/reports/tanzania0813_ForUpload_0.pdf)

**Human Rights Watch - HRW** (2011) *Poisonous Mix: Child Labor, Mercury and Artisanal Gold Mining in Mali*. <https://www.hrw.org/report/2011/12/06/poisonous-mix/child-labor-mercury-and-artisanal-gold-mining-mali>

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<http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/Documents/ASGM/Guidance%20document/Version%202.0%20Guidance%20Document.pdf>

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**UNEP** (2013) *Toolkit for Identification and Quantification of Mercury Sources, Reference Report and Guideline for Inventory Level 2, Version 1.2*, April 2013. UNEP Chemicals Branch, Geneva, Switzerland. 338pp. Last accessed on 9/30/14.

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[http://www.communitymining.org/attachments/221\\_training%20manual%20for%20miners%20GMP%20Marcelo%20Veiga.pdf%3FphpMyAdmin=cde87b62947d46938306c1d6ab7a0420](http://www.communitymining.org/attachments/221_training%20manual%20for%20miners%20GMP%20Marcelo%20Veiga.pdf%3FphpMyAdmin=cde87b62947d46938306c1d6ab7a0420)

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## ANNEX 1: Article 7 and Annex C of the Minamata Convention on Mercury

### Article 7

#### Artisanal and small-scale gold mining

1. The measures in this Article and in Annex C shall apply to artisanal and small-scale gold mining and processing in which mercury amalgamation is used to extract gold from ore.
2. Each Party that has artisanal and small-scale gold mining and processing subject to this Article within its territory shall take steps to reduce, and where feasible eliminate, the use of mercury and mercury compounds in, and the emissions and releases to the environment of mercury from, such mining and processing.
3. Each Party shall notify the Secretariat if at any time the Party determines that artisanal and small-scale gold mining and processing in its territory is more than insignificant. If it so determines the Party shall:
  - (a) Develop and implement a national action plan in accordance with Annex C;
  - (b) Submit its national action plan to the Secretariat no later than three years after entry into force of the Convention for it or three years after the notification to the Secretariat, whichever is later; and
  - (c) Thereafter, provide a review every three years of the progress made in meeting its obligations under this Article and include such reviews in its reports submitted pursuant to Article 21.
4. Parties may cooperate with each other and with relevant intergovernmental organizations and other entities, as appropriate, to achieve the objectives of this Article. Such cooperation may include:
  - (a) Development of strategies to prevent the diversion of mercury or mercury compounds for use in artisanal and small-scale gold mining and processing;
  - (b) Education, outreach and capacity-building initiatives;
  - (c) Promotion of research into sustainable non-mercury alternative practices;
  - (d) Provision of technical and financial assistance;

- (e) Partnerships to assist in the implementation of their commitments under this Article; and
- (f) Use of existing information exchange mechanisms to promote knowledge, best environmental practices and alternative technologies that are environmentally, technically, socially and economically viable.

## **Annex C**

### **Artisanal and small-scale gold mining**

#### **National action plans**

1. Each Party that is subject to the provisions of Paragraph 3 of Article 7 shall include in its national action plan:

- (a) National objectives and reduction targets;
- (b) Actions to eliminate:
  - (i) Whole ore amalgamation;
  - (ii) Open burning of amalgam or processed amalgam;
  - (iii) Burning of amalgam in residential areas; and
  - (iv) Cyanide leaching in sediment, ore or tailings to which mercury has been added without first removing the mercury;
- (c) Steps to facilitate the formalization or regulation of the artisanal and small-scale gold mining sector;
- (d) Baseline estimates of the quantities of mercury used and the practices employed in artisanal and small-scale gold mining and processing within its territory;
- (e) Strategies for promoting the reduction of emissions and releases of, and exposure to, mercury in artisanal and small-scale gold mining and processing, including mercury-free methods;
- (f) Strategies for managing trade and preventing the diversion of mercury and mercury compounds from both foreign and domestic sources to use in artisanal and small scale gold mining and processing;
- (g) Strategies for involving stakeholders in the implementation and continuing development of the national action plan;
- (h) A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury. Such a strategy should include, inter alia, the gathering of health data, training for health-care workers and awareness-raising through health facilities;

- (i) Strategies to prevent the exposure of vulnerable populations, particularly children and women of child-bearing age, especially pregnant women, to mercury used in artisanal and small-scale gold mining;
  - (j) Strategies for providing information to artisanal and small-scale gold miners and affected communities; and
  - (k) A schedule for the implementation of the national action plan.
2. Each Party may include in its national action plan additional strategies to achieve its objectives, including the use or introduction of standards for mercury-free artisanal and small-scale gold mining and market-based mechanisms or marketing tools.

## ANNEX 2: Suggested Table of Contents for a National Action Plan

### 1. Executive Summary

- Summary of the NAP
- Provides an overview for decision makers

### 2. Introduction and Background

- Rationale and context
- Overview of the preparation process (1 page maximum)

### 3. National Overview

- Summary of the detailed national baseline analysis (maximum 5 pages)
  - 1) Legal, including a review of legal and regulatory status of ASGM.
  - 2) Geographic considerations and pertinent statistics
  - 3) Demographic and other information about mining communities, including educational status, access to health care and other social services
  - 4) Economics, such as earnings per capita, mercury supply, gold trade and export
  - 5) Mining data, including information on ore bodies, processes used, the number of people directly/indirectly involved in ASGM (including gender and age considerations).
  - 6) Baseline estimates of the amount of mercury used in ASGM, and of ASGM practices (*Annex C, para 1(d)*)
  - 7) Environmental information, detailing known information such as environmental destruction, contaminated sites, mercury releases in soil, air and water.
  - 8) Information on available evidence of health impacts and mercury exposure through various media.
  - 9) Leadership and organization of ASGM at national and local levels.
  - 10) Innovative experiences in addressing AGSM.

### 4. National Objectives and Reduction Targets (*Annex C, para 1(a)*)

- List of the problem statement, goal, national objectives and reduction targets (maximum 1 page)

## 5. Implementation Strategy (10-20 pages)

- Workplan of activities in support of the NAP on ASGM objectives
  - Actions to Eliminate Worst Practices (*Annex C, para 1(b)*)
  - Steps to Facilitate Formalization or Regulations (*Annex C, para 1(c)*)
  - Strategies for reducing emissions, releases, and risks of exposure (*Annex C, para 1(e)*)
  - Managing trade of mercury and mercury compounds (*Annex C, para 1(f)*)
  - Additional strategies including market-based mechanisms (optional) (*Annex C, para 2*)
  
- Outreach plan
  - Strategy for involving stakeholders in the implementation and continuing development of the NAP (*Annex C, para 1(g)*)
  - Strategy for providing information to artisanal and small-scale miners and affected communities (*Annex C, para 1(j)*)
  
- Public health strategy (*Annex C, para 1(h)*)
  - Preventing exposure of vulnerable populations (*Annex C, para 1(i)*)
  
- Timeline
  - Schedule for implementation of the NAP (*Annex C, para 1(k)*)
  
- Overall budget

## 6. Evaluation Mechanism

- Brief description of how the national plan's strategy will be evaluated and tracked (maximum 1-2 pages)

## 7. Annexes

- Terms of reference of the working group (including names and contact addresses of members)
- Detailed national baseline analysis (20 pages maximum)
- Overall, detailed budget



## ANNEX 3: Suggested questions for consideration in data collection on ASGM sector

The answers to the following suggested questions, in addition to any others identified by the Party, will be important in the development of the detailed national baseline analysis.

### Basic sectoral profile questions:

- How many people are engaged in ASGM mining in your country?
- Where does mining and gold buying/processing take place within the country (throughout, or concentrated geographically?)
- Who does the mining and gold buying/processing – family landowners, migrant workers, immigrant workers, workers hired by landowners? Are women and children involved in the work? Do they work as individuals, collectively, or how?
- How much gold do these miners produce each year? What price do they get for gold?
- How much are they typically earning per year (or day)?
- How do the miners get access to mercury? At what price?
- How much mercury do they use to produce gold? [(K)g/mercury per (k)g/gold produced is most useful metric.]
- What are the common technologies and practices used by the miners? Which of these use the most mercury? How is crushing performed? Is mercury added to the whole ore (before or during crushing) or to concentrates? How is amalgamation performed? How is the amalgam burnt?
- How do they purify the gold (if they do) – charcoal stove, gas torch, other?
- What is the local availability of alternative technologies/local workshops? What is the level of local knowledge about alternatives?
- Are the miners aware of the health and environmental effects of mercury?
- What do the miners think about mercury versus alternatives?
- Who buys the gold from the miners? Where does the purchase take place? Do the buyers process the gold? If so how – do they use any environmental protection methods when processing the gold?
- Are government officials, agencies, or statutory bodies involved in mercury and/or gold trade?
- What is the pathway for mercury supply?
- Is there large scale gold mining in your country? Identify the companies. Are any of these companies currently working with ASG miners? Are any in direct conflict with ASG miners?

[Please describe how information was obtained and from whom.]

**Environmental and Health Impact Questions:**

- What is the scale of the impacts they are having on the landscape and other environmental media (take photos if possible)?
- What is the available capacity for environmental monitoring?
- What is the available capacity for human bio-monitoring of mercury exposure?
- Do you know current level of environmental contamination (or) exposure?
- How many environmental media (air, land and water) have been impacted?
- Are there any communities or areas considered to be particularly impacted or vulnerable to health effects of ASGM? Which ones? How?
- Are there any studies or data on environmental contamination or health impacts from ASGM? Are there plans for rehabilitation of any resulting contaminated areas?
- Do you have an estimate for mercury emissions or releases at a national level? At a regional level? What are the estimates and how were they obtained?

[Please describe how information was obtained.]

**Legal/social questions:**

- What is the legal/ regulatory status of small scale mining and gold buyers/processing? If ASGM is not already legal, what issues could arise with legalization? Are there regulations affecting gold processing?
- Are the miners organized? How?
- Do miners have access to capital?
- What is the current system by which miners get gold to market (Who do they sell gold to? Where do they get their mercury? Who are the final exporters?)
- Are miners sensitive to price of mercury?
- Is artisanal and small scale mining included in your national poverty reduction strategy?

**Education/Health Care opportunity questions**

- Are you aware of environmental awareness raising campaigns and/or worker health and safety campaigns in your country that may be linked to miners and the mining and gold buyers and processing communities?
- Are there any existing health care or social service programs geared towards miners and/or mining and gold processing communities (such as AIDs awareness, health promotion, water sanitation and/or worker health and safety programs)?
- What is the average education level in your country? What about the average miner's education or average gold buyer/gold processor education level? Are there incentives for children to stay in school in your country?
- Are there learning institutions in your country for mining or geology?
- Do the miners / mining communities have adequate access to health care? If not, for what reasons, e.g. distance to facility, lack of health insurance, lack of availability of health services, etc. (if known)?

- Do you have high fish consumption levels in your country? Are fish typically eaten species that are typically mercury-contaminated? Are other foods with potential mercury contamination (marine mammals, eg) typically eaten in your country?

**Stakeholder considerations**

- Besides miners, who are the key stakeholders at national regional and local levels, including community-based organizations active in mining communities, large scale mining companies and buyers/sellers of gold (including the Central Bank)? Please list and provide contact information where possible.

**ANNEX 4: Sample Format for Workplan, Budget and Timeline**

ASGM NATIONAL ACTION PLAN											
OBJECTIVE 1:											
ACTIVITIES	PRIORITY (high, medium, low)	FUNDING SOURCE(S)	LEAD AGENCY	ACTIVITY COST (US\$)				TIMELINE			INDICATORS
				Internal	External	In-Kind	Total	Y1	Y2	Y3	

## ANNEX 5: Example of Baseline Inventory – Burkina Faso

### Excerpt from AMAP/UNEP 2013, page 98:

“The following example describes the method used to make a class 4 estimate of Hg releases from ASGM in Burkina Faso over a two-year time frame (2011/2012). The Director of the Ministry of Mines, Geology, and Quarries estimates 600 000 adults living on 221 ASGM sites that are registered as ASGM exploitation permits, and plotted on a cadastral map. At least the same number inhabits and operates on unregistered land. Meetings were held before and again after field visits with: miners in the field, government agencies, miners associations (formal + informal), gold traders and Hg traders. The results are as follows: All ASGM activities use Hg. This began around year 2000. Whole ore amalgamation is never done. Concentrate amalgamation is done. Mercury activation is not practiced. Miners do not throw away dirty Hg. Miners never use retorts or recycle Hg in other ways –amalgam is burned using an open flame. The amount of Hg used per unit gold produced is on average 1.3 parts mercury to 1 part gold (i.e., a mercury-to-gold ratio of 1.3:1). This accounts for the Hg that ends up in the amalgam (1 part) and the Hg that is lost during processing to the tailings (0.3 parts). All Hg used is released to the environment, with 75% (that in the amalgam 1/1.33) directly emitted to the atmosphere during amalgam burning and the residual (0.3 parts) lost to the tailings.

In Burkina Faso, it is likely that the amount lost to the tailings is re-emitted to the atmosphere on a relatively short time scale of one to several years as the tailings are accumulated in above ground piles and later reprocessed. 200 000 of the 600 000 official ASGM population (1 in 3) are estimated to be active miners. They produce 20 to 30 tonnes of gold per year (~25). This is reasonable considering the known geology (abundance of gold-bearing formations of sufficient grade throughout the country), a processing lens (gold production per miner using the observed processing techniques), and through a socio-economic lens based on the cost of living at ASGM localities. This estimate was discussed with the gold buyers and site owners and the Ministry of Mines and was found to be reasonable by these groups. The amount of Hg used and emitted to the atmosphere is thereby determined as follows: 25 tonnes of gold are produced annually; all of it is amalgamated using 32.5 tonnes of Hg per annum. All amalgam is burned openly thereby emitting 25 tonnes of Hg directly to the atmosphere with the remaining 7.5 tonnes being released to the land and water in the waste stream (tailings). The Hg contained in tailings is likely to also be emitted to the atmosphere within a decade. It may be helpful to briefly describe some of the other supporting information that is typically used in determining the annual gold production and Hg use. In Burkina Faso, ASGM miners typically operate in 5–10 person partnerships consisting of diggers, haulers, crushers, millers, and amalgamators. Women also work in groups, but typically only haul, crush and process tailings. Relatively small amounts of Hg are used (1.3 units Hg for 1 unit gold) and awareness of the dangers of Hg is low and therefore retorts are not currently used for economic or health reasons, indicating that no Hg is recycled. Ore grades are high (often 10–50 g/t) but traditional mining is inefficient (15–50% recovery). On average, miners yield half a gram per day for about 270 days per year, equating to about 135g/miner/year. They receive 70–80% of the international price when selling to the local buyer who has a relationship to the land holder of the site. Using 80% of a gold price of USD 1500/oz (USD 48.24/g), each miner makes about USD 5209/year or 434/month. However, costs for miners are high and estimated to be USD 200–500/month and consist of costs for processing (milling and Hg), food, shelter, transport, and family including off-site family. The estimate for Burkina Faso serves also to make some useful points for emissions estimations in general. The previous (2005 inventory) emission estimate for

Burkina Faso was about 3 t Hg/y based on MMSD (Mining, Minerals and Sustainable Development) work in 2001 and presence/absence data from mining trade magazines and newspaper reports in 2008. The current estimate of 32.5 t Hg/y represents a ten-fold increase. This increase is not a result of increased use but rather of better reporting.”

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