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Matters for consideration or action by the Conference of the Parties: mercury and the Kunming-Montreal Global Biodiversity Framework

Integrating action to reduce mercury pollution from artisanal and small-scale gold mining into the Kunming-Montréal Global Biodiversity Framework National Biodiversity Strategies and Action Plans: Technical support document**

Note by the secretariat

1. At its fifth meeting, the Conference of the Parties to the Minamata Convention on Mercury adopted decision MC-5/17 encouraging parties and inviting other Governments and local and subnational governments, as well as relevant organizations and stakeholders, as appropriate, to reflect national mercury reduction and control targets in their revised or updated national biodiversity strategies and action plans to align with the Kunming-Montreal Global Biodiversity Framework. The secretariat was requested to support parties and other stakeholders in sharing their experience and to compile and synthesize the information gathered.

2. Accordingly, the secretariat has worked with *The Nature Conservancy* to develop a technical document to facilitate integration of actions to reduce mercury pollution from artisanal and small-scale gold mining into the Kunming-Montreal Global Biodiversity Framework National Biodiversity Strategies and Action Plans (NBSAPs).

3. The annex to the present note sets out a technical support document on integrating action to reduce mercury pollution from artisanal and small-scale gold mining into the Kunming-Montréal Global Biodiversity Framework National Biodiversity Strategies and Action Plans.

* UNEP/MC/COP.6/1.

** This document has not been formally edited.

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Annex

Technical support document: Integrating action to reduce mercury pollution from artisanal and small-scale gold mining into the Kunming-Montréal Global Biodiversity Framework National Biodiversity Strategies and Action Plans

Integrating action to reduce mercury pollution from artisanal and small-scale gold mining into the Kunming-Montréal Global Biodiversity Framework National Biodiversity Strategies and Action Plans

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A. Introduction

1. Purpose and scope of the document

Mercury (Hg, atomic number 80) is a potent neurotoxin, negatively impacting both nature and the people closely reliant on intact ecosystems for nutrition, livelihoods, and culture. It is considered by the World Health Organization (WHO) to be one of the 10 chemical substances with greatest health concerns, and has also been shown to be a major stressor to biological diversity (e.g., Scheuhammer et al. 2015). Because it persists for long periods in the environment, can travel long distances via air and water, is used in several industrial processes and in products, and yet can't be destroyed once it has been mobilized, it creates a unique global challenge. In 2017, the UN Minamata Convention on Mercury entered into force to "protect the human health and the environment from anthropogenic emissions and releases of mercury", and today, there are 152 countries have become Party to the Convention.

The current greatest source of mercury released to the environment is from gold mining (Qiu et al. 2025; UNEP 2019), where it is used in gold amalgamation. Under Article 2 of the Minamata Convention, gold mining conducted by individual miners or small enterprises with limited capital investment and production is termed artisanal and small-scale gold mining (ASGM). While gold mining operations using mercury are called small-scale, actual mining operations on the ground may be bigger in scale using more equipment and having larger capital. This document intends the term ASGM to refer to gold mining and its processing using mercury at various scales. Note that this document does not cover industrial or large-scale gold mining which is generally done using non-mercury processes for extracting the gold.

The purpose of this document is to provide support to Parties to the Convention on Biological Diversity in the development of their NBSAPs, in places where artisanal and small-scale gold mining is taking place. This current document is a follow-up to the technical report (Secretariat of the Minamata Convention on Mercury 2024) accompanying the Minamata Convention's Decision MC-5/17, which highlighted the interconnected challenges of mercury pollution and biodiversity loss, advocating for coordinated implementation of the two Conventions to generate co-benefits. It emphasized integrated policies, collaborative efforts, and shared strategies to reduce mercury's impact on ecosystems while advancing biodiversity conservation and sustainable development. As a follow-up, this current document provides step-by-step recommendations for how to integrate mercury pollution from ASGM into NBSAPs.

This document first provides a brief review of the impacts of mercury pollution on biodiversity and people (section B). Section C contains an overview of the two Conventions and step-by-step guidance for how to incorporate considerations of mercury pollution into NBSAPs. Section D provides a review of relevant information currently contained within individual Parties' plans. Section E addresses monitoring and reporting with specific suggestions of indicators. Finally, section G presents some success stories.

B. Occurrence of mercury from ASGM and its impacts on biodiversity and people

1. Socioeconomic context

ASGM is currently the largest user and emitter of mercury globally (UNEP 2019), and its rise over the last decade is offsetting mercury emissions reductions from other sources (Qiu et al. 2025). Mercury is used to extract gold from ore and alluvial sediments, typically mixed with crushed or milled ore or with alluvial sediments containing gold to create an amalgam that binds gold particles to mercury with the expectation of increasing gold recovery rates. Because of the inefficiencies and the informal nature of ASGM, a high proportion of the elemental mercury used in ASGM operations is released to the environment either as vapor to the atmosphere or liquid elemental mercury to water bodies and other ecosystems. Once in the ecosystem, it can be converted to methylmercury, which is the toxic form that can bioaccumulate in different organisms. ASGM uses millions of kg of mercury globally in different stages of mineral processing (Esdaile and Chalker, 2018).

ASGM is widespread in developing countries in South America, sub-Saharan Africa and Asia, where it often occurs in remote and poorly regulated areas (UNEP 2019, also see Figure 1). It is also one of the most challenging mercury sources to reduce because it is a complex socioeconomic issue. It is highly dispersed in often remote areas (Moomen et al. 2022). Globally, the artisanal mining sector is estimated to employ 15–25 million people, who support more than 148 million dependents (Hilson and Maconachie 2017; Steckling et al. 2017; Keane et al. 2023). In some mining areas there are migrant miners from other

areas in a country or from abroad. In some cases, miners enter Indigenous lands without permission. Organized crime groups sometimes use gold from ASGM to launder money from other illicit activities, such as drug trafficking, illegal logging, and human and wildlife trafficking (U.S. Federal Bureau of Investigation 2019; U.S. Bureau of International Narcotics and Law Enforcement 2019), and ASGM is often associated with human rights abuses, corruption, and violence (Vallejos et al. 2020).

At the same time, gold mining employs millions of low-income people, including women and children, who may have few alternative economic opportunities, and it can be a mechanism for lifting people out of poverty (Grynberg et al. 2021; Lara-Rodriguez and Fritz 2023). Efforts to reduce mercury pollution must be realistic. Unless an alternative source of livelihood presents the same or greater income and has the same promise of quick revenue as ASGM, discussions of alternative livelihoods will be challenging. Supplemental livelihoods that can support legitimate and responsible mining should be considered. These are already present at ASGM sites, including agriculture, food providers, mining equipment supplies, people who repair equipment, etc. Improving the capacity of the actors in the secondary economy that rely on legitimate mining can be beneficial to the community as it fosters increased community investment. Mining communities should also be included in efforts to safeguard local biodiversity on which they traditionally depend for their livelihoods. Linking the reduced availability and quality of fauna and flora with negative effects of mercury on nature and humans, can be a powerful narrative to mobilize local communities. Women can play an especially important role as guardians of traditional knowledge about nature, and agents of change in restoring the biodiversity, including campaigning against the use of mercury (e.g., Responsible Mines 2024).

2. Context on the status of ratification of the Minamata Convention and occurrence of artisanal and small-scale gold mining

Of the 152 Parties to the Minamata Convention, 49 have notified the Secretariat that ASGM is more than insignificant in their territories and 37 have submitted National Action Plans (NAPs) (Minamata Convention). All the Parties to the Minamata Convention that have notified the Secretariat of significant mercury releases from gold mining are also Party to the Convention on Biological Diversity (CBD) and are required to implement the Kunming-Montreal Global Biodiversity Framework (KMGBF), thus connecting these two Multilateral Environmental Agreements and highlighting the need to ensure correspondence between them. National Biodiversity Strategies and Action Plans (NBSAPs) are the primary mechanism for implementation of the KMGBF, and although all Parties to the CBD were required to submit their NBSAPs by COP16 in 2024, only 50 have done so (as of April 2025). Of those 50, six are among the top 20 mercury emitters from ASGM according to Emissions Database for Global Atmospheric Research (EDGAR v8.1_toxHg) (Muntean et al. 2024) (Burkina Faso, Colombia, Indonesia, Peru, Suriname, Tanzania (draft version)). Of these six, Colombia has explicit strategic actions for mercury reduction, including controlling the import and export of mercury in ports and controls on other environmental crimes that are often associated with ASGM, deploying an intersectoral strategy to mitigate the negative impacts of mercury poisoning on human health in priority areas, and strengthening education on the impacts of mercury. Peru and Suriname include mercury in their discussion of background and threats, but do not have explicit targets, strategies or actions. The remainder do not include mercury.

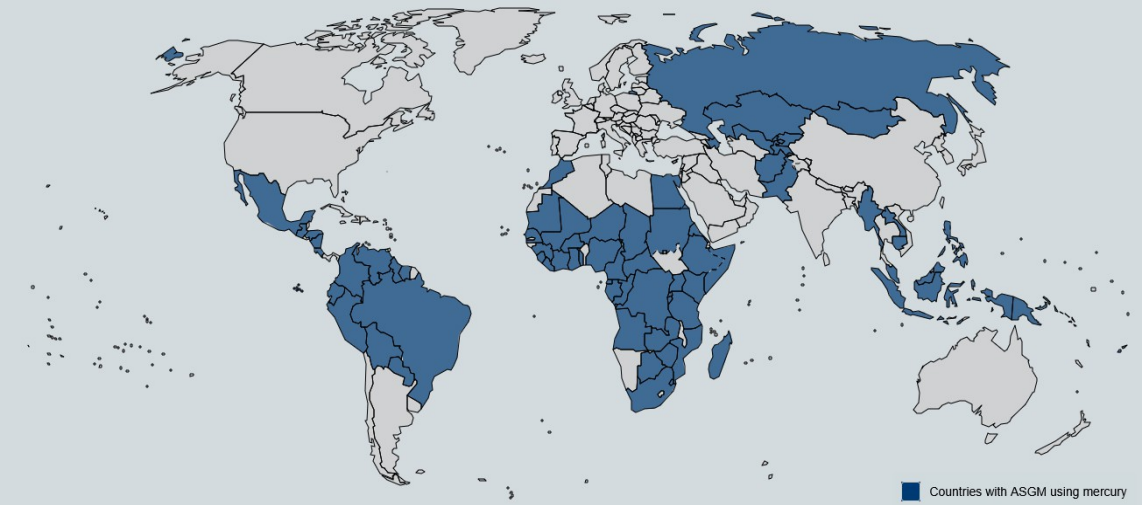

Figure 1. Countries with ASGM using mercury (in dark blue). This map shows Parties that have submitted a notification under the Minamata Convention that ASGM using mercury is more than insignificant, and non-parties where EDGAR Emissions Database (Muntean et al. 2024) estimates that mercury is emitted from ASGM. Note that there are additional countries with mercury emissions from ASGM that have not notified the Secretariat, and thus are not included in the map. Map generated from UNEP Map Builder.

3. Impacts to biodiversity from mercury contamination

Mercury contamination is most damaging to biodiversity and people near mining sites; however, mercury can also be transported long distances and contaminate species further away. Mercury concentrations are typically higher in organisms at higher trophic levels in both aquatic and terrestrial ecosystems because of its ability to biomagnify and bioaccumulate (Scheuhammer et al. 2015). Mercury is captured and concentrated in tropical forest ecosystems (Gerson et al., 2022) and in tropical aquatic ecosystems altered by mining (Gerson et al. 2020). Elevated mercury concentrations have been found in numerous animal taxa in impacted areas, including birds (Pisconte et al. 2023), bats (Moreno-Brush et al. 2016), fish (Barocas et al. 2023), and insects (Dias dos Santos et al. 2021; Eagles-Smith et al. 2020). According to a recent compilation of global available data, called the Global Biodiversity Mercury Synthesis, well over half of marine and freshwater species sampled had mercury concentrations above the widely accepted safe consumption threshold of 0.46 ug/g wet weight (Evers et al. 2024).

Elevated mercury exposure has been found to alter fish and bird reproductive organs, damage tissues, and result in decreased animal size and reproductive output (Evers 2018). Mercury contamination can dramatically reduce the reproductive potential of fish (Depew et al. 2012a, b; Evers et al. 2023).

In addition to the direct impacts of mercury contamination on fish and wildlife, gold mining activity also leads to deforestation, habitat destruction, soil degradation, increased erosion and siltation, channel dewatering, generation of solid waste, habitat fragmentation due to road construction, contamination of surface water and groundwater, and increased wildlife poaching, which further stress fragile ecosystems (Caballero Espejo et al. 2018; Bruno et al. 2020; Dossou Etui et al. 2024). ASGM often occurs in tropical regions, often in protected areas, releasing large quantities of mercury to intact and biodiverse regions such as the Amazon Basin, Indonesia, and the Congo Basin (WWF 2018; UNEP 2019; Dossou Etui et al. 2024). For more information on mercury and ASGM impacts to biodiversity, see UNEP's infographics here and here.

In addition to mercury, cyanide is also used in ASGM. Gold recovery rates are typically low with mercury amalgamation (Velásquez-López et al. 2010), but recovery rates using cyanidation, often of the mercury-contaminated tailings, can be much higher (Drace et al. 2016). This may lead to the release of mine tailings contaminated with soluble mercury-cyanide complexes, which if released into surface water bodies, may be transported far downstream (e.g., Marshall et al. 2018).

In addition to these direct impacts of mercury contamination on biodiversity, it impacts the ecosystem services provided by these species and ecosystems. Provisioning services, such as food and water, are lessened with contamination; cultural services are impacted when culturally important species are lost with

habitat destruction; and regulating services, such as hydrologic regulation from free-flowing rivers or climate regulation from intact forests, are lost when those ecosystems are degraded by ASGM activities.

4. Human health impacts from mercury exposure

The Minamata Convention recognizes the serious impacts that mercury pollution can have on people and includes protection of people's health from anthropogenic mercury emissions and releases in its objective. As affirmed in Decision MC-5/1, Indigenous Peoples, as well as local communities, are particularly vulnerable to mercury exposure and are among the first to face the serious health and environmental effects resulting from mercury pollution owing to their close relationship with the environment and its resources. Parties to the Convention have committed to ensuring the participation of Indigenous Peoples, local communities and other stakeholders in the development and implementation of ASGM national action plans as described in Decision MC-4/4 and Decision MC-5/7.

Similarly, the Convention on Biological Diversity recognizes the important linkages among biodiversity, human health, and the objectives of the Convention, and intends for the framework to be implemented with consideration of the "One Health" approach (WHO/FAO/WOAH Joint Plan 2022). Mercury is a highly toxic heavy metal to people and can lead to serious health problems for miners, their families, and nearby communities (Steckling et al. 2017). Of the estimated 15 million people directly and indirectly engaged in ASGM, 4-5 million are women and children (Keane et al. 2023). Acute exposure to high levels such as those experienced by miners can cause respiratory distress, gastrointestinal damage, kidney failure, and neurological symptoms like tremors and memory loss. Chronic exposure such as that experienced by people living near mining operations or consuming contaminated species may lead to neurological damage, cardiovascular diseases, and weakened immune systems. Women of childbearing age are at particularly high risk of passing the mercury to developing fetuses because it can pass the placental barrier, resulting in developmental delays, reduced IQ, and lifelong cognitive deficits in children, and ultimately in intergenerational impacts to communities (Basu et al. 2018).

Mercury contamination in fish has garnered particular interest because of its importance as a food source for millions of people (Lynch et al. 2016; Funge-Smith and Bennett 2019) and fish consumption is the primary pathway for mercury exposure to humans (WHO 2021; Heilpern et al. 2025). In addition to fish as a source of nutrition, many fish species are culturally important to Indigenous Peoples, as well as local communities (Noble et al. 2016), and so this contaminant damages important cultural connections to landscapes and wildlife.

C. Harmonizing Actions in the Minamata and Biodiversity Conventions

1. Intersection of the two Conventions

Under Article 7 of the Minamata Convention, Parties are required to develop a National Action Plan (NAP) when the Party has determined that ASGM and processing in its territory is found to be more than insignificant. Because mercury is an important stressor to biological diversity and to the communities reliant on biodiversity for nutrition, the Minamata Convention passed Decision MC-5/17 at COP-5 in 2023, which encouraged Parties to "Reflect national mercury reduction and control targets in their revised or updated national biodiversity strategies and action plans to align with the Kunming-Montreal Global Biodiversity Framework" (paragraph 5(b)), as well as Decision MC-5/7 related to ASGM which "calls on Parties to make further efforts to seek opportunities to advance implementation of Article 7 (regarding ASGM) in the context of projects relating to biodiversity". Furthermore, Decision MC-5/11 notes opportunities within the Global Environment Facility program areas to fund mercury reduction strategies, especially those closely linked to biodiversity and/or climate change.

While the KMGBF is not explicit regarding inclusion of mercury pollution into NBSAPs, the two Conventions are complementary. The most obvious is the pollution Target 7 of the KMGBF. While this target refers to pollution "from all sources", including "highly hazardous chemicals", it does not specifically reference mercury in the target language nor in the proposed indicators. Therefore, work is required to elevate the importance of mercury as a pollutant and the risk it poses to biodiversity and to populations vulnerable to mercury exposure, and to ensure its inclusion into proposed actions under relevant targets as well as into monitoring plans under the list of component indicators. In addition to Target 7, there are other Targets relevant to mercury pollution from ASGM (Table 1).

2. Integrating action to reduce mercury pollution from ASGM in NBSAPs

The steps below provide recommendations for how to incorporate the threat of mercury pollution to biodiversity and people into NBSAPs. The steps are as follows:

a. Coordinate with the Minamata Convention national focal point

The first step is to establish contact and collaboration between the Convention on Biological Diversity focal point and the national Minamata focal point, to facilitate a common understanding of the significance of ASGM and its processing in the country on biodiversity and to ensure strong coherence between the implementation of the two multilateral environmental agreements. In some cases, ministry officials whose portfolio includes biological diversity have significant awareness of the spatial trends, impacts to people and ecosystems, and actors involved in ASGM due to its significant effects on biodiversity, and these ministry officials may be able to contribute meaningful information and support to the Minamata focal point in developing the Party's National Action Plan. Actions identified to reduce mercury in the NBSAP must be consistent with commitments being made under the Minamata Convention and the Party's ASGM NAP. The current list of Minamata Focal Points is found here: https://minamataconvention.org/en/parties/focal-points

b. Review NAP for actions relevant to biodiversity

To incorporate actions to reduce mercury pollution into NBSAPs, Parties can first refer to actions and recommendations in their current Minamata Convention ASGM NAPs (https://minamataconvention.org/en/parties/national-action-plans), Minamata Initial Assessments (https://minamataconvention.org/en/parties/minamata-initial-assessments) or other assessments or analyses of ASGM or regulations or actions related to mercury use within their territories and determine which actions are relevant to biodiversity conservation. Doing so will ensure coherence between the implementation of the two Conventions. See section D for relevant information contained within Parties' NAPs and NBSAPs. Annex C of the Minamata Convention as well as the currently available guidance for developing a NAP include proposed actions that will improve conservation of biodiversity and the communities reliant on that biodiversity for livelihoods and nutrition.

Parties may also refer to the proposed amendments to the Minamata Convention ASGM NAP, developed by the Secretariat in collaboration with the UNEP Global Mercury Partnership, that include new sections on the review of the implementation of Article 7 (RIA), which outlines a structured approach to assess progress under the NAP, including actions that intersect with biodiversity conservation. This review process, detailed in document UNEP/MC/COP.6/7/Add.1, supports Parties in identifying successful activities, emerging challenges, and opportunities for adaptive management.

c. Select KMGBF Targets with relevance to mercury pollution

KMGBF Targets most closely related to mercury pollution fall into the following categories:

- Watershed-scale protection and restoration of areas impacted by ASGM (Targets 1, 2, 3)
- Public health strategies related to consumption of contaminated species (Targets 5, 9, 16)
- Pollution of mercury into the environment (Target 7)
- Information generation and sharing and engagement with Indigenous Peoples, rightsholders, and other communities and stakeholders (Targets 21, 22, 23)

Table 1 shows a crosswalk between these Targets and the NAP guidance and provides examples of actions to meet the objectives of each target. The sample actions in Table 1 include a combination of gold supply chain and market approaches, communication and education related to the risks of mercury pollution, technical interventions for reducing mercury use and increasing recovery, and others. Table 1 also presents sample actions under the Target they most closely relate to, though many sample actions are applicable across multiple Targets.

d. Prioritize areas for intervention

The spatial intersection between Minamata Convention NAPs and CBD NBSAPs occur within areas of high biodiversity value where there is the risk of mercury pollution. Parties may choose to emphasize actions to be taken in those areas. The identification and prioritization of areas for intervention is aligned with NBSAP Target 1, which seeks to ensure that all areas are under participatory, integrated and

biodiversity-inclusive spatial planning and/or effective management processes; Target 2, which seeks to effectively restore at least 30% of degraded ecosystems; and Target 3, which seeks to effectively conserve at least 30% of habitats globally.

Using a Geographic Information System (such as ArcGIS), spatial mapping of these areas may be done by following these steps:

1. Define the area of known and potential ASGM activity and area affected by ASGM activity

   i. Define the spatial extent of ASGM activity using available spatial data:

      a) Identify areas permitted for mining. ASGM activities will often occur adjacent to or within mining concessions (UNEP 2019; Verbrugge 2014).

      b) Identify areas mapped as ASGM occurrences. These data may be found in the National Overview section of a Party's NAP or from other sources such as work being done by other ministries, NGOs, or the private sector (e.g., Monitoring of the Andes Amazon Program (MAAP), https://www.maapprogram.org/)

      c) Use spatial surrogate data such as patterns of deforestation, which is often associated with clearing for gold mining, especially along river channels (e.g., Alvarez-Berrios and Aide 2015).

   ii. Add a 1 km[1] buffer to the spatial extent of ASGM activity identified in step 1.i, to take into consideration the health and environmental risks from (i) atmospheric transport of mercury downwind from areas with ASGM activity to adjacent areas, (ii) water-born transport of elemental mercury downstream from mining areas, and (iii) water-born transport of sediment-bound mercury downstream from mining areas.

   iii. Identify areas at risk of ASGM incursion. Information about new areas that may soon be mined can be deduced from various data sources, including road access; undisturbed areas that are adjacent to areas currently being mined; local knowledge obtained by speaking with local communities or miners; or other indicators such advertisements or the sale of mining equipment in a certain area or social media posts about mining activity.

   iv. Combine areas of ASGM activity identified in 1.i, the buffer zone identified in 1.ii, and areas at risk of ASGM incursion from 1.iii into a **total ASGM-affected area**.

2. Define the biodiversity area of interest

   i. Identify the important biodiversity areas, including protected areas, Indigenous Peoples' territories, and areas known to have high biodiversity value. These may already be defined within a Party's NBSAP.

   ii. Include habitats such as wetlands with high potential for mercury methylation. These areas may be available from the current draft of the NBSAP, or else from other sources including the scientific literature, or work being done by other ministries, NGOs, or the private sector.

3. Overlay the **biodiversity areas of interest** from step 2 with the **ASGM-affected area** from 1.iv. This final area should be the focus of NBSAP actions on mercury pollution.

UNEP has recently conducted an analysis to determine the extent of ASGM activity in Key Biodiversity Areas and Protected Areas, using NAPs that included ASGM site coordinates. See preliminary report here: https://wedocs.unep.org/bitstream/handle/20.500.11822/45632/Biodiversity-ASGM-Sites.pdf?sequence=1&isAllowed=y

[1] While specific buffer distances are not universally prescribed or mandated, research to date and guidelines suggest a "considerable distance" from water bodies and/or residential areas to minimize risks. The 1km buffer distance most likely underestimates the extent of impact and should be seen as a placeholder until better information is available. The transfer of mercury from ASGM is also influenced by landscape features, and more research is required to improve understanding of the dynamics of ASGM-related mercury (Secretariat of the Minamata Convention on Mercury 2025), so as to design an appropriate buffer distance in a given context.

Table 1. **KMGBF Targets of relevance to mercury pollution, with sample actions, and a crosswalk to elements of ASGM National Action Plans.**

NBSAP Target	NAP Element (Annex C)	Sample Actions
Target 1. Ensure that all areas are under participatory integrated biodiversity inclusive **spatial planning and/or effective management processes** addressing land and sea use change, to bring the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity, close to zero by 2030, while respecting the rights of indigenous peoples and local communities.	**1(b)** Take actions to eliminate the four worst practices: • 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 the mercury **1(c)** Take steps to facilitate formalization or regulation of the ASGM sector. **1(d)** Develop baseline estimates of the quantities of mercury used and the practices employed in ASGM and processing within its territory. **1(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	**To contribute to spatial planning processes, Parties could:** • Identify which of the four worst practices are being conducted and where. This includes collecting information on practices as well as contamination levels in people who live nearby and indicator species such as higher trophic level fish and mammals. • Consider land use planning mechanisms that protect natural resources and population centers (e.g., no handling of mercury within 1km of freshwater resources; tailings may not be discharged in or near a water body; no amalgam burning in or near residential areas). • Identify locations of ASGM sites and quantities of mercury used, including areas of deforestation from ASGM activity. See recommendations above regarding spatial prioritization of areas for intervention. • Consider degree of remoteness of potential ASGM regions. Remote areas often have higher biodiversity values since they are less settled and may warrant higher prioritization in a spatial planning process to increase their conservation. • Account for locations of vulnerable populations, including Indigenous Peoples, who may be particularly impacted or at risk of ASGM-related activities. • Consider adopting a set of comprehensive standards for ASGM, see planetGOLD criteria for environmentally and socially responsible operations at: planetGOLD Criteria for Environmentally & Socially Responsible Operations **To contribute to effective management processes, Parties could do the following:** • Regular review of mining permits to ensure these do not overlap with sensitive biodiversity areas. • Regular monitoring of mining operations to ensure they do not encroach on biodiverse areas. • Restrictions on ASGM activity within 1km of water • Bodies and tailings may not be discharged in or near a water body
Target 2. Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective **restoration**, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.	**1(c)** steps to facilitate formalization or regulation of the artisanal and small-scale gold mining sector.	• Include post-mining restoration as a condition of mining permits. • Restore habitats degraded by ASGM after mining has ended. While research is still needed to determine the most effective restoration techniques, some approaches such as back-filling mining pits, contouring steeply sloped areas, re-spreading any conserved topsoil, and replanting using native vegetation may be effective (Timsina et al. 2022). • Mercury pollution from ASGM is usually widespread, but under certain circumstances where contamination is concentrated in smaller priority habitats, including areas contaminated by tailings, remediation, including phytoremediation might be effective for mercury removal. See Georgin et al. (2024) and Wang et al. 2020 for reviews of options and constraints. • Follow the guidance to reduce the impact of mine tailings, as described in UNEP/MC/COP.4/6 (UNEP 2021)

NBSAP Target	NAP Element (Annex C)	Sample Actions
Target 3. Ensure and enable that by 2030 at least **30%** of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are **effectively conserved and managed** through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, recognizing indigenous and traditional territories, where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories	**1(c)** steps to facilitate formalization or regulation of the artisanal and small-scale gold mining sector. **1(e)** strategies for promoting reduction of emissions and releases of, and exposure to mercury in artisanal and small-scale gold mining and processing, including mercury-free methods.	• Establish and enforce rules in protected areas and prevent incursion of ASGM, especially new ASGM activity in undisturbed habitats. • Regular review of mining permits to ensure these do not overlap with sensitive biodiversity areas • Regular monitoring of mining operations to ensure no encroachment in biodiverse/sensitive areas and tailings management plans are strictly implemented. • Ban mining within areas of high priority for biodiversity, while at the same time increasing social services in the area including access to education and livelihood opportunities for communities and Indigenous Peoples. • Support Indigenous Peoples, as well as local community monitoring and environmental stewardship of their lands or territories. • Enforce legislation to prevent and combat ASGM activities taking place on Indigenous territories without their consent.
There are 3 Targets related to food consumption: **Target 5.** Ensure that the **use, harvesting and trade of wild species** is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, and reducing the risk of pathogen spill- over, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities **Target 9.** Ensure that the **management and use of wild species are sustainable**, thereby providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on biodiversity, including through sustainable biodiversity-based activities, products and services that enhance biodiversity, and protecting and encouraging customary sustainable use by indigenous peoples and local communities **Target 16.** Ensure that people are encouraged and enabled to make **sustainable consumption choices** including by establishing supportive policy, legislative or	**1(e)** strategies for promoting reduction of emissions and releases of, and exposure to mercury in artisanal and small-scale gold mining and processing, including mercury-free methods. **1(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 **1(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 **2.** Each Party may include in its National Action Plan additional strategies to achieve its	• Regular monitoring of mining operations to ensure tailings management plans are strictly implemented to prevent releases of contaminants into aquatic ecosystems. • Support a public health campaign with communities who consume wild species, especially children and women of child-bearing age, to make healthy food choices including eating species at lower trophic levels with less potential for bioaccumulation, including fish and other aquatic foods. • Support monitoring for mercury contamination in wild species and the people who eat them. • Adopt applicable responsible gold standards for ASGM gold. • Create incentives for and facilitate responsible gold buying infrastructure.

NBSAP Target	NAP Element (Annex C)	Sample Actions
regulatory frameworks, improving education and access to relevant and accurate information and alternatives, and by 2030, reduce the global footprint of consumption in an equitable manner, including through halving global food waste, significantly reducing overconsumption and substantially reducing waste generation, in order for all people to live well in harmony with Mother Earth	objectives, including the use or introduction of standards for mercury-free artisanal and small-scale gold mining and market-based mechanisms or marketing tools.	
Target 7. Reduce **pollution** risks and the negative impact of pollution from all sources, by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution	**1(b)** Take actions to eliminate the four worst practices: • 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 the mercury	• The following actions are some examples of broad approaches to reduce the use of mercury in ASGM. Given the deleterious impacts of mercury on biodiversity and Indigenous Peoples as well as local communities who live in or near mining areas, any actions to reduce mercury use will be beneficial: • Facilitate collaboration between informal miners and conventional mining companies, who can process the ore using conventional non-mercury techniques in their processing facilities (see Veiga et al. 2022, 2025). This has the potential to decrease mercury use while increasing the gold recuperation rate from 30-40% to 70-80% (United Nations 2020). • Provide miners with training on techniques and equipment for reduced and zero-mercury mining, including applying simple concentration methods prior to adding the mercury rather than whole ore amalgamation; using mercury capture methods such as retorts in countries that allow mercury use in ASGM; and removal of residual mercury (e.g. by concentration) from the tailings prior to cyanide leaching. Detailed descriptions of retorts and other mercury capture devices are available in UNIDO's training manual (UNIDO 2006), in the UNEP guide to reducing mercury in ASGM (UNEP 2012), and in the USEPA's technology demonstration of mercury capture systems in gold shops (Argonne National Laboratory 2008, 2013). • Identify mechanisms that will assist miners with financial and technical capacity to transition away from worst practices to reduced- and, if feasible, zero-mercury mining practices. • Establish land-use policies that prohibit the burning of amalgam within or close to residential areas. • Collaborate with academic or vocational institutions, mining equipment distributors, mining engineers and others to provide long- term technical assistance to miners.
Target 7.	**1(c).** Steps to facilitate the formalization or regulation of the ASGM sector, including:	• Develop a vision for the ASGM sector, particularly through the National Action Plan on ASGM, and ensure it is linked to local and national development plans to ensure consistency and complementarity.

NBSAP Target	NAP Element (Annex C)	Sample Actions
	• engaging stakeholders • developing, implementing, and enforcing policies • monitoring and enforcement • facilitating access to markets and creating economic incentives	• Develop tools on how to manage ASGM operations, which may include decentralized small to medium enterprises, cooperative promotion, and other models. • Perform policy and regulatory review and amend laws and regulations as necessary to encourage formalization. For example, where ASGM is not already specifically addressed, laws and permitting requirements, regulations and sanctions tailored to the ASGM sector can also 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 need to be reviewed and linked with ASGM policy and regulation. • Provide adequate areas where miners can legally operate, including mining and processing of ore. • Review the institutional capacity (including monitoring and enforcement) required by formalization and identify resources to enhance this capacity. 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 several government agencies, including local government entities, Indigenous rights- holders, and other stakeholders. • Include strategies to improve monitoring and enforcement of ASGM requirements. • Facilitate access to markets by improving laws, regulations and administration related to responsibly mined gold from formal ASGM operations permitted by the country. • Consider using incentives to facilitate formalization, including special tax holidays, benefit sharing arrangements, and other incentives. • Develop initiatives to improve miner access to credit and financial management skills. More detailed information for all these actions can be found in the NAP guidance. *To increase the relevance of formalization to biodiversity, emphasize implementation in or near ecologically sensitive areas, restrictions on specific ASGM practices with collateral impacts to biodiversity such as deforestation and improper mine waste management (where tailings may enter natural water bodies), and rehabilitation and decontamination of natural habitats.*
Target 7.	**1(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	• Establish positive relations with miners and the local community at key sites. • Develop a baseline assessment team that understands the technical, social, economic, political, and ore processing context. Establishing these teams at the community level is important and to link with local academic institutions can be advantageous in maintaining institutional capacity to update the assessments. Many countries will have already made some baseline estimate of mercury released from ASGM in their Minamata Initial Assessments or NAPs. There is also some information available on a global scale - see the 2018 Global Mercury Assessment . • 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.

NBSAP Target	NAP Element (Annex C)	Sample Actions
		More detailed information for all these actions can be found in the NAP guidance *To increase the relevance of baseline estimation to biodiversity, emphasize estimation in or near ecologically sensitive areas as well as areas that are of cultural significance to Indigenous Peoples*
Target 7.	**1(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	• Connect miners to conventional mining entities who may be able to process ore using conventional techniques and achieve higher gold yields without the use of mercury (e.g., Veiga et al. 2022). • Develop a training program to inform miners of techniques for reducing their reliance on mercury, including improved concentration and zero- mercury techniques. Establishing partnerships with local vocational schools or training academies near mining areas can be helpful in disseminating the training programs. • Provide miners and gold purchasers with technical assistance including access to laboratories to conduct ore sampling. For miners, hands-on training on mercury-free technologies and for countries that allow mercury use in ASGM access to retorts, mercury capture devices and proper storage of mercury. • Assist ASGM communities with developing infrastructure for well-contained and managed amalgamation (e.g., centralized amalgamation sites), in cases where mercury use is allowed in ASGM in the country. • Identify sites with contaminated tailings and develop a strategy for remediation or containing and/or reprocessing the tailings. More detailed information for all these actions can be found in the NAP guidance *To increase the relevance of mercury use reductions to biodiversity, emphasize implementation in or near ecologically sensitive areas and rehabilitation and decontamination of natural habitats,*
Target 7.	**1(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	• Update national mercury use inventory. • Investigate how mercury enters the country and is traded and link results with mercury-use inventory, especially if a key use is in ASGM. • Identify sectors using mercury or have exemption to use mercury and establish control regimes to prevent diversion of mercury to ASGM. • Review adequacy of local laws affecting mercury trade, especially for ASGM. • Ensure and enact domestic laws that are consistent with Minamata Convention obligations. • Strengthen coordination mechanism on trade with other countries. • Develop module for training customs officials on mercury detection and relevant policies.
Target 8. Minimize the **impact of climate change** and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster		• Minimize carbon emissions from ASGM sites, such as by using clean energy and by restoring mine sites with native vegetation (see example here: https://www.responsiblemines.org/wp-content/uploads/2025/06/Carbon-footprint-infographic-ENG.pdf) .

NBSAP Target	NAP Element (Annex C)	Sample Actions
risk reduction actions, including through nature-based solution and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity		
Target 21. Ensure that the **best available data, information and knowledge, are accessible** to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity, and to strengthen communication, awareness-raising, education, monitoring, research and knowledge management and, also in this context, traditional knowledge, innovations, practices and technologies of indigenous peoples and local communities should only be accessed with their free, prior and informed consent,23 in accordance with national legislation	**1(g).** Strategies for involving Indigenous rights-holders and other stakeholders in the implementation and continuing development of the national action plan	• Develop and carry out a plan for Indigenous rights-holders and other stakeholder engagement and participation in the formalization process including 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, • Establish monitoring programs in data-poor regions and for poorly understood processes, including the establishment of labs that are equipped for mercury analysis. • Identify key non-government actors who are familiar with ASGM activities and may be able to provide data. • Adopt recommended steps in the Minamata Convention draft guidelines on the effective engagement of Indigenous Peoples and local communities, in developing and implementation national action plans on ASGM.
Target 22. Ensure the full, equitable, inclusive, effective and gender- responsive **representation and participation in decision-making**, and access to justice and information related to biodiversity by indigenous peoples and local communities, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge, as well as by women and girls, children and youth, and persons with disabilities and ensure the full protection of environmental human rights defenders **Target 23.** Ensure **gender equality** in the implementation of the framework through a gender-responsive approach where all women and girls have equal opportunity and capacity to contribute to the three objectives of the Convention, including by recognizing their equal rights and access to land and natural resources and their full, equitable, meaningful and informed participation and leadership at all levels of action, engagement, policy and decision-making related to biodiversity	**1(g).** Strategies for involving Indigenous rights-holders and other stakeholders in the implementation and continuing development of the national action plan **1(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 **1(j).** Strategies for providing information to artisanal and small-scale gold miners and affected communities	• Collaborate directly with Indigenous Peoples and other communities who may already have work plans, monitoring protocols, and objectives for reducing ASGM and mercury contamination in their territories. • Engage leaders at the community level and ensure the needs of Indigenous rights-holders and other stakeholders are met to enable participation in consultation sessions. • Hold consultation meetings in or nearby communities affected by mining and processing. • Support and provide separate opportunities for participation of women's groups or collectives to ensure representation of all voices within the community. • Establish and maintain a communication schedule among all rights-holders and stakeholders.

D. Review of currently available information in NAPs and NBSAPs

1. Review of biodiversity considerations in ASGM NAPs

In general, the information related to biodiversity in Parties' submitted ASGM NAPs is somewhat weak, with a greater focus on human health impacts. Two exceptions stand out: the Zambia NAP included the following statement which is relevant to all Parties and would be useful to include in all NAPs: "While the human cost of mercury poisoning in ASGM is the most important and immediate concern, mercury pollution also damages the wider ecosystem—compromising food chains and biodiversity". The Uganda NAP assessed ASGM within protected areas and designed strategic actions around strengthening management capacity of protected areas including a process for allocating mining leases within protected areas. This latter set of actions is important given frequent incursions of ASGM into protected areas and the high coincidence of ASGM and high biodiversity areas (Moomen et al. 2022; Dossou Etui et al. 2024).

Some information on biodiversity impacts can be found in the section entitled "environmental information", however the contents here often focus on soil, air, and water pollution rather than elements of biodiversity (i.e., species, habitats, and ecosystems). Few NAPs describe impacts on terrestrial biodiversity due to deforestation, terrestrial habitat destruction, increased poaching resulting from ASGM, and even fewer call out negative impacts of ASGM on river connectivity, hydrology, and aquatic habitats, all of which are common in areas where there is ASGM. Direct impacts of mercury contamination on fish and other aquatic species could also be enhanced further with more information on bioaccumulation in wildlife or other impacts to biodiversity.

Under the "health information" section of NAPs, some NAPs are missing health impacts through consumption of wild species, including fish consumption, which is highly relevant to many Indigenous Peoples and other traditional communities, for whom fish or other wild species may be a primary protein source. Some NAPs discuss high mercury levels in large marine fish but do not mention freshwater fish, which are often consumed in areas with ASGM. These gaps may be due to the lack of baseline data. A few countries assessed mercury levels in fish in their NAPs, for example, the Indonesia NAP provides baseline data on fish mercury concentrations and a recommendation to reduce consumption of contaminated fish. The Guyana NAP has a sub-section called "exposure through food" under the "health information" section but is careful to state "the complete elimination of fish from the diet is not the recommendation but rather the reduction of the frequency of consumption of larger species that tend to be higher up on the food chain" – an important consideration given the importance of fish for nutrition and food security.

Regarding monitoring and testing mercury levels, not all NAPs explicitly mention testing mercury concentrations in fish or other high-trophic level species, and/or developing standards for consumption thresholds for mercury concentrations in fish. A few Parties' NAPs call out mercury levels in fish as one of the actions and indicators. The Kenya NAP called out synergy and coordination with Kenya's Fisheries Management and Development Act, with targets actions on mercury concentration monitoring in fish: "…carry out fish quality monitoring on the five pre-determined sites", "carry out mercury levels monitoring in the fish, sediments and various fish species along rivers near gold mining areas". The Uganda NAP includes actions on "developing a reporting/feedback mechanism from sectors in charge of water, agriculture, minerals, environment, academia, research and fisheries on inspected/monitored indicators related to water catchments, water bodies, flora and fauna for pollution risks at ASGM sites" and "assessing levels of mercury contamination in soil, water, land, fish, breast milk for ASGM and infants whose mothers work in gold mines".

2. Review of mercury considerations in NBSAPs

To date, of the countries with significant mercury emissions from ASGM that have submitted updated NBSAPs in alignment with KMGBF, a limited number include explicit strategies and actions to reduce mercury pollution:

- Colombia:
    - Regarding Target 5 (use, harvesting and trade of wild species) "Set up 5 Transnational Integrated Centers for the control of environmental crimes that implement specific bi- or plurinational agreements to counteract illegal mining, the control of the entry and exit of mercury in ports, deforestation, the illegal trafficking of species of flora and fauna, land grabbing, extensive livestock farming and drug trafficking from the perspective of criminal finances."

  - Regarding Target 7 (reducing pollution risk) “Deploy an intersectoral strategy to mitigate negative impacts on human health derived from mercury poisoning in the departments with the highest number of reported cases (Cauca, Córdoba, Nariño, Chocó, Antioquia, Atlántico, Bogotá, Sucre, Vaupés and Bolívar), as well as in the areas of National Natural Parks. This strategy will prioritize decontamination initiatives using traditional methods or phytoremediation.”
  - Regarding Target 21 (data and information accessibility) “Strengthening of education plans on the effects of mercury, practical spaces for collective action and the exercise of citizen control.”

- Tanzania:
  - Regarding Target 7: Strengthen measure to reduce levels of hazardous chemicals in inland waters including those emanating from Artisanal and Small-scale Gold Mining (ASGM)
  - Implement relevant national plans under the Minamata Convention.
- Peru and Suriname describe mercury contamination and ASGM in the background section of their NBSAPs, but do not have explicit targets, strategies, or actions. Suriname calls out synergy with Minamata Convention in its NBSAP.
- A few other countries with ASGM using mercury have relevant statements or descriptions in submitted national targets but have not submitted their full NBSAPs and/or the CBD website has not been updated with recent submissions. For example:
  - Bolivia mentions "regulating the import and export of mercury” under Target 7 “by 2030, degradation and pollution of ecosystems is effectively reduced and prevented, ensuring their ecological integrity, human health and the environment.”
  - Gabon describes under Target 7 "identify the levels of pollution impact from all sources, including noise, plastic pollution, mercury, other heavy metals...” as part of the objective "assess pollution levels and reduce them to levels that do not harm biodiversity"
  - Uganda has taken action to address mercury contamination within their NBSAP, but this information is not available on the CBD web site.
  - Kenya proposed "mercury waste threshold levels" as one of its national indicators
  - Sudan proposed “reduction in traditional gold mining" as one of its national indicators

In some cases, actions identified in an ASGM NAP may be sufficient for including directly into a NBSAP.

In other cases, it will be necessary to bolster the actions identified in the NAP, prioritize the ones that are targeted toward areas of important biodiversity, or develop new actions.

E. Monitoring and Reporting

Selection of appropriate indicators is an effective means for Parties to ensure inclusion of mercury under the monitoring and reporting requirements of the KMGBF. These NBSAP indicators can be used to track implementation of actions and report on progress towards their national biodiversity targets. The term “monitoring” used in KMGBF is at a different scale than more specific monitoring described in the Minamata Convention, which emphasizes data collection and analyses to understand “the presence and movement of mercury and mercury compounds in the environment, as well as trends in levels of mercury and mercury compounds observed in biotic media and vulnerable human populations” (Minamata Convention Article 22). To support evaluation of the effectiveness of actions in NBSAPs to reduce mercury pollution and impacts to biodiversity from ASGM activities, Parties may choose to follow the Minamata Convention’s guidance on mercury monitoring, and report on progress using indicators suggested in Table 2 below.

It is also important to acknowledge that the environmental behaviour of mercury in tropical ecosystems, where most of the ASGM occurs, remains insufficiently understood. Improving the understanding of the dynamics and environmental fate of mercury from ASGM is of significant concern to human and environmental health. Designing and implementing targeted research studies and monitoring initiatives to serve this purpose contributes to the tracking, reporting, as well as effectiveness evaluation of both KMGBF and Minamata Convention.

1. Monitoring and indicators guidance in KMGBF

Monitoring, using indicators, is fundamental to assessing the status and trends of biodiversity and related socio-economic issues and evaluating the effectiveness of policy and management decisions. The KMGBF defines indicators as "summary measures related to a key issue or phenomenon and derived from a series of observed facts of reported perceptions, attitudes or expectations", and they serve two main purposes: (1) to measure the level of progress towards a goal, target or outcome, and (2) to measure if planned activities have been carried out. The KMGBF is accompanied by a detailed monitoring framework that outlines a set of agreed-upon indicators for tracking Parties' implementation and progress towards their Goals and Targets. The monitoring framework is composed of four groups of indicators to be used by Parties for planning, monitoring and reporting of implementation of national targets and the agreed global goals and targets of the KMGBF:

- **Headline**: a minimum set of high-level indicators, which capture the overall scope of the Goals and Targets of the KMGBF to be used for planning and tracking progress. They are nationally, regionally and globally relevant indicators validated by Parties. These indicators can also be used for communication purposes.
- **Binary**: global indicators based on responses to yes/no questions to be included in the draft national reporting template. They will provide a count of the number of countries having undertaken specified activities.
- **Component**: A list of optional indicators that, together with the headline indicators, cover all components of the Goals and Targets of the KMGBF and which may apply at the global, regional, national and subnational levels.
- **Complementary**: a list of optional indicators for thematic or in-depth analysis of each Goal and Target which may be applicable at global, regional, national, and subnational levels.

Under the KMGBF, headline and binary indicators are to be reported by Parties in the national reports but also serve as the basis for global analysis and for informing the Conference of the Parties when it reviews progress towards implementation of the Framework. Component and complementary indicators provide more in-depth information on progress but are not required for reporting. The monitoring framework can be further supplemented by additional national and subnational indicators developed by Parties.

When developing and updating NBSAPs, Parties should align each national target to at least one corresponding headline indicator. They are also encouraged to review and adopt additional component and complementary indicators to address specific aspects of their national actions and targets, to inform assessment of progress and outcomes. In addition to indicators, Parties are advised to (1) establish or strengthen a national tracking system for NBSAP implementation, and (2) outline plans for an inclusive process to produce regular national reports that link the national tracking systems as well as monitoring, evaluation and reporting for other biodiversity-related multilateral agreements (WWF 2023).

2. Suggestions of mercury-related indicators for KMGBF monitoring plans

Mercury is not included in the list of headline indicators at the time of writing this report. However, each Party to the KMGBF and Minamata Convention can include component or complementary indicators related to mercury within their monitoring plans. Table 2 lists some options for indicators associated with the Targets included in Table 1. These indicators were summarized from the Secretariat of the Minamata Convention on Mercury (2024) report on mercury and biodiversity and recently released technical guides on mercury monitoring, including "Guidance on monitoring of mercury and mercury compounds to support evaluation of the effectiveness of the Minamata Convention" (Secretariat of the Minamata Convention on Mercury 2021) and "Mercury monitoring in and around artisanal and small- scale gold mining sites – A Technical Background Document" (Secretariat of the Minamata Convention on Mercury 2025). Parties can reference these technical guidelines for more detailed information about indicator selection, sampling design, sampling methods and tools, ancillary measurements, analytical methods, etc. (Secretariat of the Minamata Convention on Mercury 2021, 2025).

Table 2. **Indicators for Targets listed in Table 1, which can be used in monitoring plans for both the KMGBF and ASGM NAPs.**

KMGBF Target	Examples of joint indicators
Target 1 (spatial planning and/or effective management)	Number of zoning regulations and land use planning rules that take into account potential effects of mercury emissions on biodiversity Percentage of mining area covered by biodiversity-inclusive spatial plans Percentage of mining area with action plans to control emissions and releases of mercury within areas of high biodiversity values Number of sites previously contaminated with mercury that have been zoned for reduced mercury or mercury-free mining.
Target 2 (restoration)	Area of mercury contaminated sites or abandoned ASGM sites restored or rehabilitated Levels of mercury in soil or sediment within a 1km radius around restored or rehabilitated mining sites Percentage increase of degraded ASGM sites restored or rehabilitated Number or area of tailing ponds restored
Target 3 (30% effectively conserved and managed)	Extent of protected areas that overlap with known ASGM sites that are effectively managed through coherent implementation of the Minamata Convention and the KMGBF Number of laws or regulations enacted to protect Indigenous Peoples' and other traditional territories that are at risk from external ASGM activities Area of Indigenous Peoples and other traditional territories that are regularly monitored for the presence of mercury above thresholds that are deemed safe Area of protected and conserved areas that are regularly monitored for the presence of mercury above thresholds that are deemed safe Number of existing ASGM sites within protected and conserved areas complying with environmental standards
Target 5 (use, harvesting, and trade of wild species)	Level of awareness among Indigenous Peoples and other traditional communities of the impacts of mercury Levels of mercury in fish tissues from regularly consumed species, in and around ASGM sites Level of unsustainable hunting and use of wild species associated with ASGM activities (either done by miners or as a result of mining encroachment into a particular territory)
Target 7 (pollution)	Levels of mercury in air, soil, sediment, and/or water Trends (spatial and temporal) in mercury levels in air, soil, sediment, and/or water Levels of mercury in tissues (muscle) from non-migratory high-trophic level fish Levels of mercury in tissues (muscle, blood, egg, or keratin tissues) from high-trophic-level fish-eating species (birds and mammals)
Target 9 (benefits to people from management and use of wild species)	Levels of mercury in fish tissues in and around ASGM sites Number of people engaged in education on mercury effects on human health and environment Levels of mercury in blood, urine, or hair samples from people vulnerable to mercury exposure following Minamata Convention's monitoring guidelines (UNEP/MC/COP.4/INF/12)
Target 16 (sustainable consumption choices)	Number of ASGM miners participating in certification programmes that reduce mercury use, emissions and releases in mining Number of Indigenous Peoples, traditional communities and other relevant rights-holders and stakeholders indicating that their needs and priorities with regard to the use of mercury in ASGM are being addressed Number of people being reached with awareness campaigns regarding mercury-contaminated food consumption

KMGBF Target	Examples of joint indicators
Target 21 (best available data, information, and knowledge are accessible)	Activities taken to demonstrate and emphasize the interconnections between biodiversity loss and mercury pollution Growth in number of records and species in the Global Biotic Mercury Synthesis (GBMS) database (Evers et al. 2024) Number of mercury monitoring programs established, including the establishment of labs that are equipped for mercury analysis. Availability of a national database of mercury levels and trends in selected natural water bodies and/or landscapes.
Target 22 (representation and participation in decision-making)	Number of mercury monitoring and awareness raising programmes for Indigenous Peoples and traditional communities Number of by-laws and ordinances developed in ASGM districts with participation from affected populations, Indigenous Peoples, and other stakeholders. Number of consultation meetings in or nearby communities affected by mining and processing. Percentage of Indigenous Peoples, traditional communities and other rights- holders and stakeholders who report decision-making on ASGM is inclusive and responsive
Target 23 (gender equity)	Activities and programmes that recognize the equal rights of women and their informed participation and leadership at all levels of action, engagement, policy and decision-making related to mercury and biodiversity-positive action Number of mercury monitoring and awareness raising programmes designed for women and girls Percentage of women and girls who report improvement in equal opportunity and capacity Percentage of women and girls in ASGM districts engaged in alternative livelihood activities

3. Review of indicators contained within NBSAPs

In the current KMGBF monitoring framework, indicators (across headline, binary, component and complementary) regarding the overall risk from highly hazardous chemicals are absent. There is ongoing work under the Minamata Convention to advocate for inclusion of mercury-related indicators in the KMGBF monitoring framework. However, some Parties' NBSAP monitoring plans do include reference to ASGM, mercury, hazardous chemicals, and/or mining:

- Colombia includes two indicators, one is "area of illegal mining", and another is "percentage progress in the implementation of a mining formalization strategy".
- Kenya has not yet submitted their NBSAP but has included "mercury waste threshold levels" in their draft national targets.
- Sudan has not yet submitted their NBSAP but has included "reduction in traditional gold mining" in their draft national targets.
- Mozambique included the indicator "percentage of area degraded by excess nutrients, pesticides and highly hazardous chemicals".
- Indonesia included the indicator "area of restoration of used land or mining sites or community mining activities".

One way to increase the likelihood of inclusion of mercury and ASGM in Parties' NBSAPs is to include biodiversity- and/or environment- related indicators in Parties' ASGM NAPs. This harmonization would reduce duplication in monitoring data collection between these two Conventions. Some Parties have done this including:

- Uganda:
    - Number of abandoned ASGM sites restored
    - Number of ASGM mine sites observing environmental restoration and proper waste disposal
    - Number of ASGM sites observing environmental standards
    - Number of environmental and social impact assessments and public hearings conducted before awarding of ASGM rights

- Number of tools received by different ministries, departments and agencies to enable early detection of mercury contamination in environmental samples including air, land and water
- Number of Environment Protection Police Force (EPPF) and Police Minerals Police Unit (PMPU) officials trained to carry out their mandate
- Number of stakeholder engagements held to agree on sustainable co-existence of ASGM activities with biodiversity in protected areas
- Number of ASGM sites observing environmental standards in protected areas
- Number of ESIAs and stakeholder consultations conducted prior to awarding licenses in protected areas
- Percentage reduction in impact of upstream and downstream ASGM activities in wetlands and water bodies.

- Zambia:
  - Mercury levels in the environment (soil, air, water, sediment, biota)
  - Availability of a database of concentration levels of mercury in selected natural water bodies
  - No mining and non-mining rights offered in protected and sensitive areas
  - No mining/processing activities in protected and sensitive areas
  - Number of environmental clearance licenses issued to ASGM
  - Number of reported cases of human wildlife conflicts.
- Indonesia:
  - Mercury contaminated land in four locations is remediated.

F. Case Studies & Best Practices in ASGM Mercury Reduction

Mercury contamination from ASGM activity remains a global problem and in general, there is limited systematic evidence to show the effectiveness of technologies or methods promoted to accelerate a transition to mercury-free ASGM. However, there are cases where Parties have succeeded in reducing the use of mercury in mining activities, and these examples can be used by other Parties as models. The list below is not meant to be exhaustive but rather is meant to illustrate promising approaches. The broader impacts of these case studies (particularly on public health and environmental conditions) require long-term monitoring and evaluation.

- The planetGOLD programme (Phase 1), funded by the Global Environment Facility and led by the UN Environment Programme, pilots and promotes alternative mercury-free technologies and processes with ASGM communities. planetGOLD focuses on four program areas: technical solutions, access to finance, formalization, and access to markets. Projects also engage in awareness raising and promote gender equity across these pillars. Pilot projects from Burkina Faso, Colombia, Ecuador, Guyana, Indonesia, Kenya, Mongolia, Peru, and the Philippines reported significantly reduced mercury use, improvements in health and environmental conditions, widespread adoption of safer practices, and establishment of formal ASGM cooperatives. Miners also reported increased gold recovery rates and reduced health risks (planetGOLD 2023). Common lessons learned from these pilots highlight the importance of early and continuous engagement with local communities and governments, comprehensive training programs for miners as well as continuous technical support and follow-ups to maintain safer practices. Developing innovative financing solutions to support procurement of mercury-free equipment and regular monitoring and evaluation of activities are equally vital for ensuring durable outcomes.
- Adoption and transition to gravity concentration process in Kalinga province, northern Philippines: Enabling factors include intensive and continuous education on negative impacts of mercury and how to use mercury-free techniques, leadership of an Indigenous association (small-scale mining controlled by the Banao Bodong Association), and very high local mercury prices that made mercury-free methods more economically appealing. See https://news.mongabay.com/2024/08/can-nations-ever-get-artisanal-gold-mining-right/
- Co-existence model (artisanal miners sell ore to large-scale companies for them to process ore in a more responsible fashion): The co-existence model aims to formalize artisanal miners, improve their economic benefits, and reduce environmental pollution. Veiga et al. (2022) provides examples from Peru, Suriname, Nicaragua, Colombia, Costa Rica, and Ecuador, and summarizes

three main categories of co-existence models: (1) artisanal miners operating on land covered by the mineral titles of mining companies, (2) mining companies operating on sites covered by artisanal mining cooperatives, (3) processing plants of mining companies buy ores and/or tailings from different sources. These models have benefits and drawbacks, including challenges in trust-building, environmental concerns, and the need for reliable gold content evaluation processes. Enabling factors include strong trust between artisanal miners and the processing company and willingness for miners to accept a cut in profit. Co-existence between artisanal miners and conventional mining companies can lead to formalization and reduced mercury use, but it is not a universal solution and depends on good engagement and infrastructure. This model has the potential to eliminate bureaucracy and ensure cleaner operations, making it a viable option for generating more income and reducing environmental impacts.

- Between 2019 and 2022, Conservation X Labs hosted the Artisanal Mining Grand Challenges, awarding over US$1 million in prizes, to support reform of the ASGM sector. This initiative attracted and funded innovative solutions around monitoring data, cleaner mining tools, remediation and restoration for recovering post-ASGM landscapes and waters, and supply chain tools such as Fairmined certification (https://fairmined.org/). The approach also attracted diverse innovators new to the ASGM sector and issues, and fostered new collaboration between public sector, private sector, civil society, and mining communities and Indigenous Peoples. Emerging success stories from solutions include the development and use of the "Mining Impact Calculator" (a digital economic valuation tool developed by Conservation Strategy Fund to calculate social and environmental impact of illegal gold mining in the Amazon) which contributed to legal cases that closed some illegal mining operations, and the pilot of "Copper Plates" (a technique using silver-coated copper plates to decontaminate gold-bearing ASGM tailings developed by Pure Earth) which successfully recovered an initial 300-400 tons of mercury in total from mining waste in Colombia (Conservation X Lab 2025).

Recently, researchers at Duke University launched an effort to develop the evidence base and identify best strategies (https://globalhealth.duke.edu/news/breaking-mercurys-stubborn-hold-gold).

G. Summary

This document demonstrates the strong alignment between implementation of the goals of the Minamata Convention on Mercury and the Convention on Biological Diversity and offers numerous opportunities for inclusion of actions to reduce the risk of mercury contamination from ASGM in Parties' NBSAPs. Those actions fall principally under the KMGBF Target 7 related to pollution, but also under targets related to watershed scale planning, protection, and restoration; the protection and management of wild foods; and inclusion of equity and participation in decision-making of those people most reliant on biodiversity. Finally, this report offers options for indicators to include in Parties' NBSAPs to monitor implementation and outcomes of actions to reduce mercury contamination.

H. References

Alvarez-Berríos, N. L. and T. M Aide. 2015. Global demand for gold is another threat for tropical forests. Environmental Research Letters, 10:1 014006. doi:10.1088/1748-9326/10/2/029501

Argonne National Laboratory. 2008. Technology Demonstration for Reducing Mercury Emissions from Small-Scale Gold Refining Facilities, ANL/EVS/TM/08-6.

Argonne National Laboratory. 2013. Manual for the Construction of a Mercury Capture System for Use in Gold Processing Shops. Prepared for U.S. Environmental Protection Agency Office of International and Tribal Affairs.

Barocas A, C. Vega, P.A. Alarcon, J.M. Araujo Flores, L.E. Fernandez, J. Groenendijk, J. Pisconte, D.W.

Macdonald, R.R. Swaisgood. 2023. Local intensity of artisanal gold mining drives mercury accumulation in neotropical oxbow lake fishes. Science of the Total Environment 886:164024. https://doi.org/10.1016/j.scitotenv.2023.164024

Basu N., M. Horvat, D.C. Evers, I. Zastenskaya,P. Weihe, and J. Tempowski. 2018. A state-of-the-science review of mercury biomarkers in human populations worldwide between 2000 and 2018. Environmental Health Perspectives 126(10). https://doi.org/10.1289/EHP3904

Bruno D.E., D.A. Ruban, G. Tiess, N. Pirrone, P. Perrotta, V.A. Mikhailenko, V.A. Ermolaev, N.N. Yashalova. 2020. Artisanal and small-scale gold mining, meandering tropical rivers, and geological heritage: Evidence from Brazil and Indonesia. Science of the Total Environment 715:136907

Caballero Espejo J., M. Messinger, F. Román-Dañobeytia, C. Ascorra, L.E. Fernandez, and M. Silman. 2018. Deforestation and forest degradation due to gold mining in the Peruvian Amazon: A 34-year perspective. Remote Sensing 10(12):1903

Conservation X Labs (2025). Gold Reimagined: Outcomes & Lessons from Open Innovation to Transform the Artisanal and Small-Scale Gold Mining Sector. Available at: https://www.conservationxlabs.com/gold-reimagined-report

Depew D.C., N. Basu, N.M. Burgess, L.M. Campbell, D.C. Evers, K.A. Grasman, and A.M. Scheuhammer. 2012a. Derivation of screening benchmarks for dietary methylmercury exposure for the common loon (Gavia immer): rationale for use in ecological risk assessment. Environmental Toxicology Chemistry 31:2399–2407.

Depew D.C., N. Basu, N.M. Burgess, L.M. Campbell, E.W. Devlin, P.E. Drevnick, C.R. Hammerschmidt, C.A. Murphy, M.B. Sandheinrich, J.G. Wiener. 2012b. Toxicity of dietary methylmercury to fish: derivation of ecologically meaningful threshold concentrations. Environmental Toxicology Chemistry 31:1536–1547

Dias dos Santos A.N., M. C. N. d. N. Recktenvald, D.P. de Carvalho, E.L. Bortoleto Puerta, I.F. de Sousa- Filho, J.G. Dórea, W.R. Bastos. 2021. Mercury in birds (aquatic and scavenger) from the Western Amazon. Environmental Research 201. https://doi.org/10.1016/j.envres.2021.111574

Dossou Etui, I. M., M. Stylo, K. Davis, D.C. Evers, V.I. Slaveykova, C. Wood, and M.E. Burton. 2024. Artisanal and small-scale gold mining and biodiversity: a global literature review. Ecotoxicology, 33: 484-504.

Drace, K., A.M. Kiefer, and M.M. Veiga. 2016. Cyanidation of mercury-contaminated tailings: potential health effects and environmental justice. Current environmental health reports, 3: 443-449.

Eagles-Smith C.A., J.J. Willacker, S.J. Nelson, C.M. Flanagan Pritz, D.P. Krabbenhoft, C.Y. Chen, J.T. Ackerman, E.H. Campbell Grant, and D.S. Pilliod. 2020. A national scale assessment of mercury bioaccumulation in United States national parks using dragonfly larvae as biosentinels through a citizen-science framework. Environmental Science Technology 54(14):8779–8790

Esdaile, L.J. and J.M. Chalker. 2018. The mercury problem in artisanal and small-scale gold mining. Chemistry–A European Journal 24.27: 6905-6916

Evers D.C. 2018 The effects of methylmercury on wildlife: A comprehensive review and approach for interpretation, in: Dellasala, D.A., Goldstein, M.I. (Eds.), Encyclopedia of the Anthropocene. Elsevier, Oxford, pp. 181–194. https://doi.org/10.1016/B978-0-12-809665-9.09985-7

Evers D.C., J.T. Ackerman, S. Akerblom, D. Bally, N. Basu, K. Bishop, N. Bodin, H.F. Veitberg Braaten, M. Burton, P. Bustamante, C. Chen, J. Chételat, L. Christian, R. Dietz, P. Drevnick, C. Eagles-Smith, L.E. Fernandez, N. Hammerschlag, M. Harmelin-Vivien, A. Harte, E. Kruemmel, J. Lailson-Brito, G. Medina, W. Painpain, C.A. Barrios Rodriguez, I. Stenhouse, A. Sunderland, T. Takeuchi, T. Tear, C. Vega and S. Wilson. 2024. Global mercury concentrations in biota: Their use as abasis for a global biomonitoring framework. Ecotoxicology 33: 325-396.

Funge-Smith, S. and A. Bennett. 2019. A fresh look at inland fisheries and their role in food security and livelihoods. Fish and Fisheries, 20(6), 1176-1195.

Georgin, J., D. S. P. Franco, Y. Dehmani, P. Nguyen-Tri, and N. El Messaoudi. 2024. Current status of advancement in remediation technologies for the toxic metal mercury in the environment: A critical review. Science of The Total Environment, 174501.

Gerson, J.R., S.N. Topp, C.M. Vega, J.R. Gardner, X. Yang, L.E. Fernandez, E.S. Bernhardt, and T.M. Pavelsky. 2020. Artificial lake expansion amplifies mercury pollution from gold mining. Science advances, 6(48), p.eabd4953.

Gerson J.R., N. Szponar, A.A. Zambrano, B. Bergquist, E. Broadbent , C.T. Driscoll, H. Hsu-Kim. 2022. Amazon forests capture high levels of atmospheric mercury pollution from artisanal gold mining. Nature Communications 13:559. https://doi.org/10.1038/s41467-022-27997-3

Grynberg, R., F. K. Singogo, R. Grynberg, and F.K. Singogo. 2021. The ASGM Sector in Africa: Lessons from China. African Gold: Production, Trade and Economic Development, 49-109.

Health Canada 2025. Health Canada's Maximum Levels for Chemical Contaminants in Foods. Available at: https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/maximum-levels-chemical-contaminants-foods.html#a4

Heilpern, S. A., A.S. Flecker, S. López-Casas, P.B. McIntyre, L. Moya, S. Sethi, and K.J. Fiorella. 2025. Accessible, low-mercury, and nutritious fishes provide win-wins for conservation and public health. One Earth, 8(1).

Hilson, G. and R. Maconachie. 2017. Formalising artisanal and small-scale mining: insights, contestations and clarifications. Area 49(4):443–451. https://doi.org/10.1111/area.12328

Keane, S., L. Bernaudat, K.J. Davis, M. Stylo, N. Mutemeri, P. Singo, P. Twala, I. Mutemeri, A. Nakafeero, and I.D. Etui. 2023. Mercury and artisanal and small-scale gold mining: Review of global use estimates and considerations for promoting mercury-free alternatives. Ambio, 52: 833-852.

Lara-Rodríguez, J. S. and M.M. Fritz. 2023. How does eliminating mercury from artisanal and small-scale gold mining lead to achieving sustainable development goals?. In Natural Resources Forum (Vol. 47, No. 2, pp. 214-228). Oxford, UK: Blackwell Publishing Ltd.

Levin-Nally, E., Hruschka, F., Racionero-Gómez, B., Uribe, N., Smith, C., and J. Stacey. 2019. Developing Forest-Smart Artisanal and Small-Scale Mining (ASM) Standards. Annex 1: FOREST-SMART ASM STANDARD. Prepared for the World Bank by Levin Sources, the Alliance for Responsible Mining, and Fauna & Flora International. Available at: https://www.responsiblemines.org/wp-content/uploads/2022/09/P1722450eecba500f08013097ce07ad20bb.pdf

Lynch, A.J., S.J. Cooke, A.M. Deines, S.D. Bower, D.B. Bunnell, I.G. Cowx, V.M. Nguyen, J. Nohner, K. Phouthavong, B. Riley, and M.W. Rogers. 2016. The social, economic, and environmental importance of inland fish and fisheries. Environmental reviews, 24: 115-121.

Marshall, B.G.; M.M. Veiga; R.J. Kaplan, R.A. Miserendino, G. Schudel, B. Berquist, J.R. Guimaraes, and C. Gonzalez-Mueller. 2018. Evidence of Transboundary Mercury and Other Pollutants in the Puyango-Tumbes River Basin, Ecuador-Peru. Environmental Science Processes and Impacts 20: 638–641.

Moomen, A. W., P. Lacroix, A. Benvenuti, M. Planque, T. Piller, K. Davis, M. Miranda, E. Ibrahim, and G. Giuliani. 2022. Assessing the applications of earth observation data for monitoring Artisanal and small- scale gold mining (ASGM) in developing countries. Remote Sensing, 14(13): 2971.

Moreno-Brush M., J. Rydberg, N. Gamboa, I. Storch, and Biester. 2016. Is mercury from small-scale gold mining prevalent in the southeastern Peruvian Amazon? Environmental Pollution 218:150–159. https://doi.org/10.1016/j.envpol.2016.08.038

Muntean, Marilena; Crippa, Monica; Guizzardi, Diego; Pagani, Federico; Becker, William; Banja, Manjola; Schaaf, Edwin; Simonati, Andrea (2024): EDGAR v8.1 Global Mercury Emissions. European Commission, Joint Research Centre (JRC) [Dataset] doi:10.2905/83b507d7-5218-4dc5-95f9-0ec36f073204 PID: http://data.europa.eu/89h/83b507d7-5218-4dc5-95f9-0ec36f073204

New Jersey Department of Health. 2009. Hazardous substance fact sheet. Available at: https://nj.gov/health/eoh/rtkweb/documents/fs/1183.pdf

Noble M., P. Duncan, D. Perry, K. Prosper, D. Rose, S. Schnierer, G. Tipa, E. Williams, R. Woods, J. Pittock. 2016. Culturally significant fisheries: keystones for management of freshwater social-ecological systems. Ecology and Society 21(2). http://www.jstor.org/stable/26270409

planetGOLD (2023). Making Mercury History in Artisanal & Small-Scale Gold Mining: Technology Transfer Experiences in the planetGOLD Programme. https://www.planetgold.org/sites/default/files/planetGOLD%20Technology%20Transfer%20Activities_COP5%20Inf%20Doc_June30.pdf

Pisconte J.N., C.M. Vega, E. Quispe, C.S. Sevillano-Rios, V. Tejada, C. Ascorra, M.R. Silman, L.E. Fernandez. 2023. Elevated mercury exposure in bird communities inhabiting Artisanal and Small-Scale Gold Mining landscapes of the southeastern Peruvian Amazon. Ecotoxicology 33, 472–483 (2024). https://doi.org/10.1007/s10646-024-02740-4

Qiu, X., M. Liu, Y. Zhang, Q. Zhang, H. Lin, X. Cai, J. Li, R. Dai, S. Zheng, J. Wang, Y. Zhu, H. Shen, G. Shen, X. Wang, and S. Tao. 2025. Declines in anthropogenic mercury emissions in the Global North and China offset by the Global South. Nature Communications, 16(1), 1179. https://doi.org/10.1038/s41467-025-56274-2

Responsible Mines 2024. Plantas Del Pacífico Colombiano. Conocimiento Ancestral En La Minería Artesanal De Oro Y La Restauración De Bosques. Available at: https://www.responsiblemines.org/wp-content/uploads/2025/05/1.-Folleto-Triptico-COP16-3.pdf

Scheuhammer A., B. Braune, H.M. Chan, H. Frouin, A. Krey, R. Letcher, L. Loseto, M. Noël, S. Ostertag, P. Ross, M. Wayland. 2015. Recent progress on our understanding of the biological effects of mercury in fish and wildlife in the Canadian Arctic. Sci Total Environ 509–510:91–103. https://doi.org/10.1016/j.scitotenv.2014.05.142

Secretariat of the Minamata Convention on Mercury. 2024. Mercury and biodiversity – Opportunities for generating co-benefits from the implementation of the Minamata Convention on Mercury and the Kunming-Montreal Global Biodiversity Framework. Geneva.

Secretariat of the Minamata Convention on Mercury. 2025. Mercury monitoring in and around artisanal and small-scale gold mining sites – A Technical Background Document. Scientific and Technical Series, Vol. 4. Geneva: Secretariat of the Minamata Convention on Mercury, 86 pp.

Steckling N, M. Tobollik, D. Plass, C. Hornberg, B. Ericson, R. Fuller, and S. Bose-O'Reilly. 2017. Global burden of disease of mercury used in artisanal small-scale gold mining. Annals of Global Health 83(2):234–247

Timsina, S., N.G. Hardy, D.J. Woodbury, M.S. Ashton, S.C. Cook-Patton, R. Pasternack, and M.P. Martin. 2022. Tropical surface gold mining: A review of ecological impacts and restoration strategies. Land Degradation & Development, 33(18), pp.3661-3674.

UNEP (UN Environment Programme). 2012. Reducing Mercury Use in Artisanal and Small-scale Gold Mining: a Practical Guide. Available at https://www.unep.org/resources/report/reducing-mercury-use-artisanal-and-small-scale-gold-mining-practical-guide

UNEP (UN Environment Programme). 2019. Global Mercury Assessment 2018. UN Environment Programme, Chemicals and Health Branch Geneva, Switzerland. Available at https://www.unep.org/resources/publication/global-mercury-assessment-2018

UNEP (UN Environment Programme). 2021. Guidance document on the management of artisanal and small scale gold mining tailings. Minamata Technical document UNEP/MC/COP.4/6. Available at: https://minamataconvention.org/en/documents/guidance-document-management-artisanal-and-small-scale-gold-mining-tailings

United Nations 2020. TSA Study on the Artisanal and Small-Scale Gold Mining Sector in Ecuador, Partnership for Action on Green Economy, UN Environment, International Labour Organization, UN Development Programme, UN Industrial Development Organization, and UN Institute for Training and Research, Available at: https://www.greenindustryplatform.org/research/targeted-scenario-analysis-tsa-study-artisanal-and-small-scale-gold-mining-sector-ecuador

UNIDO 2006. Manual for Training Artisanal and Small-Scale Gold Miners. Available at: https://www.unep.org/globalmercurypartnership/resources/guidance/manual-training-artisanal-and-small-scale-gold-miners

U.S. Environmental Protection Agency. 2025. National Primary Drinking Water Regulations. Available at: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations

U.S. Environmental Protection Agency. 2025. Guidelines for eating fish that contain mercury. Available at: https://www.epa.gov/mercury/guidelines-eating-fish-contain-mercury

U.S. Federal Bureau of Investigation. 2019. https://www.fbi.gov/news/testimony/illicit-mining-threats-to-us-national-security-andinternational-human-rights-120519

U.S. Bureau of International Narcotics and Law Enforcement. 2019. https://www.state.gov/illicit-mining-threats-to-u-s-nationalsecurity-and-international-human-rights/

Vallejos, P.Q., P.G. Veit, P. Tupila, K. Reytar. 2020. Undermining Rights: Indigenous Lands and Mining in the Amazon. World Resources Institute and Amazonian Network of Georeferenced Socio-environmental Information. Available at: https://www.wri.org/research/undermining-rights-indigenous-lands-andmining-amazon

Veiga, M. M., O.J. Restrepo-Baena, and G. De Tomi. 2022. Coexistence of artisanal gold mining with companies in Latin America. The Extractive Industries and Society, 12, 101177.

Veiga, M., Anene, N.C., and E. M. Silva. 2025. Four Decades of Efforts to Reduce or Eliminate Mercury Pollution in Artisanal Gold Mining. Minerals 15: 376. https://doi.org/10.3390/min15040376

Velásquez-López, P.C., M.M. Veiga, and K. Hall. 2010. Mercury balance in amalgamation in artisanal and small-scale gold mining: identifying strategies for reducing environmental pollution in Portovelo-Zaruma, Ecuador. Journal of Cleaner Production, 18: 226-232.

Verbrugge, B. 2014. Capital interests: A historical analysis of the transformation of small-scale gold mining in Compostela Valley province, Southern Philippines. The Extractive Industries and Society, 1:86-95.

Wang, L. D. Hou, Y. Cao, Y.S. Ok, F.M.G. Tack, J. Rinklebe, and D. O'Connor. 2020. Remediation of mercury contaminated soil, water, and air: A review of emerging materials and innovative technologies, Environment International, Volume 134, 2020, 105281, ISSN 0160-4120, https://doi.org/10.1016/j.envint.2019.105281.

World Health Organization. 2005. Mercury in Drinking water. Background document for development of WHO Guidelines for Drinking water quality. Available at: https://www.who.int/docs/default-source/wash-documents/wash-chemicals/mercury-background-document.pdf

World Health Organization. 2020. 10 chemicals of public health concern. Available at: https://www.who.int/news-room/photo-story/photo-story-detail/10-chemicals-of-public-healthconcern

World Health Organization. 2021. Exposure to Mercury: a major public health concern, 2nd edition. Available at: https://www.who.int/publications/i/item/9789240023567

World Health Organization, Food and Agriculture Organization, & World Organisation for Animal Health. 2022. One Health Joint Plan of Action (2022–2026). Available at: https://www.who.int/publications/i/item/9789240059139

World Wildlife Fund (WWF). 2018. Healthy Rivers Healthy People. Addressing the mercury crisis in the Amazon. A report for WWF by Dalberg. Available at https://wwf.panda.org/wwf_news/?338470/Toxic-mercury-poisoning-the-Amazon

World Wildlife Fund (WWF). 2023. The NBSAPs we need: WWF's Criteria for Ambitious NBSAPs. Available at: https://wwfint.awsassets.panda.org/downloads/wwf-nbsaps-we-need-2023_final.pdf

I. Additional Resources

NBSAP Forum https://www.learningfornature.org/wp-content/uploads/2020/07/Technical-guidance-to-support-the-alignment-of-national-biodiversity-targets-with-the-Kunming-Montreal-Global-Biodiversity-Framework-and-relevant-decisions-GM.pdf

CBD page on NBSAPs (incl. introduction, guidance, format for submission, NBSAPs submitted, etc): https://www.cbd.int/nbsap

CBD page on NBSAPs training (also available through the link above): https://www.cbd.int/nbsap/training

GEF technical guidance to support the alignment of NBSAPs with the KM-GBF: https://www.learningfornature.org/wp-content/uploads/2020/09/EN_Technical-Guidance-on-Biodiversity-Target-Alignment_4-May-2024.pdf

CMS Guidelines on integrating migratory species into NBSAPs (2011): https://www.cbd.int/doc/nbsap/NBSAP-guidelines-CMS.pdf

NBSAPs and synergies among Biodiversity-related Conventions: https://www.cms.int/sites/default/files/uploads/NBSAP%20Guidance%20Document%20on%20MEAs%20Focused%20on%20Species%20Targets.pdf

UN EMG Guidance on integrating human rights in NBSAPs: https://unemg.org/wp-content/uploads/2022/12/NBSAP-guidance-final.pdf

OHCHR guidance on integrating human rights into NBSAPs: https://www.ohchr.org/sites/default/files/documents/issues/climatechange/information-materials/integrating-hr-in-national-biodiversity-strategies-action-plans.pdf

TNC Steps to update NBSAPs: https://www.nature.org/content/dam/tnc/nature/en/documents/TNC_NBSAP_14April_final.pdf

ICRI guidance on integrating coral reef into NBSAPs: https://icriforum.org/wp-content/uploads/2024/03/ICRI_Integration_Coral_Reefs_NBSAPs_Guidance_2024_FINAL_V3.pdf

WWF "The NBSAPs We Need": https://wwfint.awsassets.panda.org/downloads/wwf-nbsaps-we-need-2023_final.pdf

Biovision "Boost NBSAPs through Agroecology": https://www.agroecology-pool.org/national-biodiversity-strategies-and-action-plans/

Ramsar Conv Upscaling wetland conservation, restoration and wise use through NBSAPs: https://www.ramsar.org/sites/default/files/2023-11/GBF_NBSAP_e.pdf

Ramsar Conv Guidance on including wetlands in NBSAPs: https://www.ramsar.org/sites/default/files/2024-08/TR12_NBSAPs_KM_GBF_rev2_e.pdf

Uganda's roadmap for the implementation of the Kunming-Montreal Global Biodiversity Framework Oct 2023. https://eservices.nema.go.ug/assets/pdf/GBF%20Road%20Map.pdf

Guidelines on the integration of migratory species into national biodiversity strategies and action plans. https://www.cms.int/sites/default/files/document/doc_27_guidelines_nbsap_e_0.pdf