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National Action Plan

for Artisanal and Small-Scale Gold Mining in Lao PDR in Accordance with the Minamata Convention on Mercury 2020 - 2030



National Action Plan for Artisanal and Small-Scale Gold Mining in Lao PDR
in Accordance with the Minamata Convention on Mercury
2020-2030

Department of Pollution Control and Monitoring
Ministry of Natural Resources and Environment
Lao PDR

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Message from the Minister

On behalf of the Government of the Lao PDR, I have the greatest pleasure to present the National Action Plan for Artisanal and Small-Scale Gold Mining in Lao PDR in accordance with the Minamata Convention on Mercury 2020 – 2030. This National Action Plan is based on the results of a baseline study conducted in 2017-2018.

Mercury is regarded as one of the dangerous substances posing severe harm to human health and ecological systems. While its use and trade have been globally restricted, its stock and illegal use in the country, along with people's low level of awareness of its harms, have posed an unpredictable threat to the people and environment.

Although Lao PDR does not produce primary mercury, various evidence reveals that the artisanal and small-scale gold mining sector is a significant emission source of mercury into the environment. Hence, the completion of this National Action Plan marks the first step to reduce and eliminate the use of mercury in the artisanal and small-scale gold mining sector in Lao PDR.

This National Action Plan is comprised of 6 objectives and 71 activities to be implemented during the period of 2020-2030. Despite many challenges, including capacity limitation and the lack of regulatory framework and funding resources, the Government of the Lao PDR is determined to commit to the Minamata Convention, which, among other things, aims to reduce and eliminate mercury use in the artisanal and small-scale gold mining sector as part of its mercury elimination plan.

Despite a lack of knowledge in mercury management and elimination, this action plan will provide basic guidelines to the relevant national agencies and institutions of Lao PDR to organise activities and implement actions towards mercury reduction and elimination in the artisanal and small-scale gold mining sector and other sectors.

I would like to take this opportunity to express my heartfelt appreciation to relevant ministries, institutions, artisanal and small-scale miners, leaders and members of mining communities, and local and regional gold traders, for their hard work and cooperation during the conduct of the baseline inventory of mercury use in the artisanal and small-scale gold mining sector. Also, on behalf of the Government of the Lao PDR, I would like to extend our sincere gratitude to all development partners; institutional organisations; and civil societies, notably the Global Environment Facility, United Nations Environment Programme, and Artisanal Gold Council, for their support and guidance in the formulation of this National Action Plan for Artisanal and Small-Scale Gold Mining in Lao PDR.



Bounkham VORACHIT

Minister of Natural Resources and Environment



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Abbreviations and Acronyms

Ag	Chemical symbol of silver
AGC	Artisanal Gold Council
AGM	Artisanal Gold Mining
ASGM	Artisanal and Small-Scale Gold Mining
Au	Chemical symbol of gold
Cu	Chemical symbol of copper
DGM	Department of Geology and Minerals under Ministry of Energy and Mines
DOEM	Provincial Department of Energy and Mines under Ministry of Energy and Mines
DOM	Department of Mines under Ministry of Energy and Mines
DPCM	Department of Pollution Control and Monitoring
EMC	Emerging Markets Consulting Limited
FAO	Food and Agriculture Organization
Fe	Chemical symbol of iron
g	Gram
GEF	Global Environment Facility
GoL	Government of Lao PDR
Hg	Chemical symbol of mercury
ICA	Institutional Capacity Assessment
Kg	Kilogram
LAK	Lao Kip
Lao PDR	Lao People's Democratic Republic
LFND	Lao Front for National Development
LYU	Lao Youth Union
LSGM	Large-scale gold mining
M&E	Monitoring and evaluation

MAF	Ministry of Agriculture and Forestry
MeHg	MethylMercury
MEM	Ministry of Energy and Mines
MES	Ministry of Education and Sports
MIA	Minamata Initial Assessment
MICT	Ministry of Information, Culture and Tourism
MINDECO	Mitsui Mineral Development Engineering Co., Ltd
MLSW	Ministry of Labour and Social Welfares
MOD	Ministry of Defence
MOF	Ministry of Finance
MOFA	Ministry of Foreign Affairs
MOH	Ministry of Health
MOIC	Ministry of Industry and Commerce
MOJ	Ministry of Justice
MONRE	Ministry of Natural Resources and Environment
MOST	Ministry of Science and Technology
MPS	Ministry of Public Security
MPWT	Ministry of Public Works and Transport
NAP	National Action Plan
NBCANAP	National Biodiversity Conservation Area National Action Plan
NUOLNBCA	National University of Laos National Biodiversity Conservation Area
PbNUOL	Chemical symbol of lead National University of Laos
PONREPb	Provincial Department of Natural Resources and Environment under Ministry of Natural Resources and Environment Chemical symbol of lead
POEMPONRE	Provincial Department of Energy and Mines under Ministry of Energy and Mines Provincial Department of Natural Resources and Environment under Ministry of Natural Resources and Environment
SGMPOEM	Small-scale gold mining Provincial Department of Energy and Mines under Ministry of Energy and Mines
UNEP SGM	United Nations Environment Programme Small-scale gold mining
UNIDOUNEP	United Nations Industrial Development Organization United Nations Environment Programme
USDUNIDO	US dollar United Nations Industrial Development Organization
USD	US dollar

1 Executive Summary

Artisanal and small-scale gold mining (ASGM) is an important income-generating activity in many provinces of Lao PDR. The sector provides important informal economic opportunities, particularly in rural areas where few other opportunities exist. Despite its development potential, ASGM is also a source of social and environmental concerns. One of the most detrimental issues related to the sector is the use of mercury to separate gold from ore, which has negative impacts on the environment and the health of miners and surrounding communities. This National Action Plan (NAP) proposes actions to reduce and, if possible, eliminate mercury use in ASGM in Lao PDR.

In order to develop this National Action Plan, a baseline study was conducted to provide an overview of the ASGM sector, summarising findings on the distribution of activity, informal governance, general mineralogy, gold and mercury supply chains, technologies used, socioeconomics (gender breakdown), and knowledge gaps. The study also makes first attempts to qualify where and how mercury is used in ASGM to isolate gold doré from ore and, where possible, quantify the range of mercury used in typical operations, the amount of gold produced, and the workforce involved. The study provides a knowledge base to inform effective NAP strategies, actions, and targets.

According to the baseline study conducted in 2017-2018, a minimum estimate of 2,258 kg of ASGM gold (100% pure) is produced in Lao PDR per year, a primary workforce of 2,118 miners exists, and there is an estimated miner mercury use of 94 – 212 kg per year, and an estimated trader mercury use of 0 – 153 kg per year. This total is representative only of a subsample of identified known and suspected active ASGM sites; 5 of 49 artisanal (AGM) sites and 8 of 20 small-scale (SGM) sites. The true quantities of mercury use are thought to be much higher than the estimates reported here due to secrecy around mercury use, especially among ASGM operators who do not have mercury listed as part of their operations on their environmental permit.

In addition to the baseline study, a rapid health situation assessment and an assessment of the institutional capacity of the health sector to address health issues of ASGM communities, and in particular mercury exposure, were conducted, serving as the basis for the development of the public health strategy with a focus on ASGM regions that can be found in this plan.

The results of these studies conducted in the context of the NAP project show that ASGM can significantly benefit rural communities and alleviate poverty in the villages where ASGM activities are carried out. However, the adverse environmental and health impacts of the long-term use of mercury and other related toxic chemicals, such as cyanide, need to be addressed to transform the ASGM sector into a more sustainable and environmentally responsible activity.

To achieve this goal, Lao PDR defined the following objectives for this Plan:

Objective 1
To effectively reduce mercury use in the ASGM sector by 20% in 2024, by 50% in 2027, and 70% by 2030.

Objective 2
To amend the existing legal instruments and develop mercury-focused regulations with an emphasis on effective law enforcement.

Objective 3
To undertake sound management measures related to mercury trade, in particular illegal trade and diversion of mercury into the ASGM sector.

Objective 4
To iteratively strengthen the institutional capacity to address mercury use at both the central level and local level and to promote the participation of stakeholders in converting to less mercury intensive ASGM practices.

Objective 5
To enhance the public awareness of health and environmental issues related to mercury use in ASGM, particularly amongst women, children, and vulnerable populations.

Objective 6
To develop and implement national policies and incentives that promote mercury-free and sustainable ASGM gold production.

The specific targets, strategies, and actions linked to these objectives are listed in sections III and IV of this plan. This plan covers the period 2020-2030 and is expected to cost 5,805,000 USD to implement.

2 Introduction and Background

In order to address the environmental and health issues related to mercury use in ASGM and in other industrial sectors, Lao PDR acceded to the Minamata Convention ("The Convention") on mercury on 27 August 2017. As the ASGM sector is a major source of mercury emission to the atmosphere and release to land and water, causing environmental pollution and severe health risks, Article 7 of the Convention requires countries that determine ASGM activities to be more than insignificant in their territory to develop a national action plan to reduce, and where feasible, eliminate the use of mercury and mercury compounds within three years of the treaty entering into force.

To support Lao PDR in the development of the NAP and the Minamata Initial Assessment, the United Nations Environment Programme (UNEP), in collaboration with the Ministry of Natural Resources and Environment (MONRE) and the Artisanal Gold Council (AGC), have implemented the project "Development of Minamata Initial Assessment and Updating of National Action Plan for Artisanal and Small Scale Gold Mining in Lao PDR," financed by the Global Environment Facility (GEF).

On October 30, 2017, the MONRE issued Decision No.5656/MONRE on the appointment of the steering Committee, Working Group, and Secretariat of the Committee for the Minamata Initial Assessment and the National Action Plan Project. In this decision, the Department of Pollution Control and Monitoring (DPCM) was appointed to lead the Steering Committee, which consist of six Committee member from Department of Pollution Control and Monitoring and Department of the Planning and Cooperation, MONRE, Department of Geology of Ministry Energy and Mine (MEM), Department of Chemistry, Ministry of Defense (MOD), Department of Hygiene and Health Promotion, and Ministry of Health (MOH).

To provide technical-level support to the committee, MONRE appointed a technical working group consisting of 21 members, most of whom are Division Directors from various departments of MONRE, Women's Union, Labour Union, Ministry of Foreign Affairs (MOFA), National University of Laos (NUOL), Ministry of Industry and Commerce (MOIC), Ministry of Public Security (MPS), MEM, the Lao Youth Union (LYU), Lao Front for National Development (LFND) and Ministry of Planning and Investment and National Assembly.



3 National Overview

3.1 Previous experiences in addressing ASGM

In 2003, the United Nations Industrial Development Organization (UNIDO), in collaboration with Earth Systems Lao, conducted an environmental and health assessment in several artisanal and small-scale gold mining sites of Luang Prabang province as part of the Global Mercury Project. The study revealed that the presence of mercury in aquatic animals in the Mekong River and Nam Ou River and in sampled human blood and urine was relatively low[1].

In the same year (2003), as part of the Global Mercury Project, Earth Systems Lao conducted a baseline sociological study in eight villages located along the Mekong and the Nam Ou rivers. The study also included a survey of ASGM villagers' health through interviews with the head of family of 271 randomly selected families from eight villages. The survey results suggested mild signs of mercury poisoning in the surveyed villages and raised potential health risks among women in the surveyed villages as women were more likely to be exposed to mercury through their role of heating amalgam at home without using any personal protective measures. In 2007, the Global Mercury Project concluded with three workshops in the northern, central, and southern regions of Laos, which raised awareness among stakeholders on the dangers of mercury use in ASGM. The final report concluded that stakeholders understood these educational materials and reported having little knowledge of the dangers of mercury prior to the workshop. Many government officials also reported that they had been unaware of the widespread use of mercury in ASGM.[2]

In 2008, UNIDO-Global Mercury Project published "Results of the Awareness Campaign and Technology Demonstration for Artisanal Gold Miners" conducted in Brazil, Indonesia, Laos, Sudan, Tanzania, and Zimbabwe. The locations chosen for implementing the awareness-raising campaign were Lak Sao District in Bolikhamxay Province and Sanamxay District in Attapeu Province. In Nakadok village of Lak Sao District, where approximately 40 mills operated, it was reported that for capturing every 1 g of gold, 3 g of mercury was used. The total mercury loss for this area was estimated to be 67.5 kg over a mining season (approximately 75 days per year).[3]

1 Global Mercury Project. (2003). *Removal of Barriers to the Introduction of Cleaner Artisanal Gold Mining and Extraction Technologies in Pak Ou and Chomptet Districts. Lao PDR.*

2 Randy Baker, Hermann Wotruba, Erin Aucoin, et al., *Global Mercury Project: Lao People's Democratic Republic (PDR) Final Summary Report,* (Project EG/GLO/01/G34 "Removal of Barriers to Introduction of Cleaner Artisanal Gold Mining and Extraction Technologies," April 2017)

3 UNIDO (2008). Results of the Awareness Campaign and Technology Demonstration for Artisanal Gold Miners, Summary Report. (Project EG/GLO/01/G34 "Removal of Barriers to Introduction of Cleaner Artisanal Gold Mining and Extraction Technologies," April 2018).

A World Bank report on the sustainable development of the mining sector in the Lao PDR (World Bank 2006) provides a brief introduction on the main characteristics of artisanal gold mining in Lao PDR based on a field survey in Luang Prabang, Savannakhet, and Borikhamxay. It concluded that artisanal gold mining remained an important source of income to rural farmers, apart from agriculture activities, and families may yield 10 to 40 g of gold per year. The report also recorded a few cases of underwater mining using oxygen cylinders to dive and excavate gold-bearing sediments (at that time, the Government had no regulations forbidding gold mining in rivers and tributaries). Such activities allowed the miners to earn an average of USD 50 a day.[4]

Moretti and Garrett (2018), in their recent publication, mention the history, present context, and main drivers of artisanal gold mining in Lao PDR. Their article points out that artisanal and small-scale mining activities are often carried out informally and that women make up between 50 % and 80 % of the miners. The report estimated that panners can earn up to USD 641 a year through gold panning activities. This figure has significant meaning in rural livelihood improvement. The report pointed out that the artisanal and small-scale mining activities were expanding, driven by a recent price-induced "gold rush," weak law enforcement of illegal ASGM, improved transportation infrastructure, and mining technologies and know-how among the miners.[5]



4 Mitsui Mineral Development Engineering Co., Ltd (MINDECO), (2006). 'Final Report for Sector Plan For Sustainable Development of the Mining Sector in the Lao PDR.' Washington, DC: World Bank. Available at siteresources.worldbank.org/INTLAOPDR/Resources/FR_4_MiningInfrastructure_.pdf

5 Moretti., D and N. Garrett, (2018). Artisanal and small-scale mining governance: the 'emerging issue' of 'unregulated mining' in Lao PDR- Kuntala Lahiri-Dutt, Between the Plough and the Pick, informal artisanal and small-scale mining in the contemporary world, Australian National University Press.

3.2 Geographical distribution of ASGM

Literature review and stakeholder workshops attended by national, provincial, and local government officials in 2018 identified 69 ASGM sites as active or suspected to be active throughout 13 of the country's 18 provinces. Officials noted the presence of illegal and informal activity throughout many of the provinces, the location of which was not always known. Officials also stated no ASGM activities, legal or illegal, are occurring within the bounds of Phongsali, Bokeo, Louang Namtha, Houaphan, and Khammouan. A map of the known active ASGM sites can be found in Figures 1 and 2.

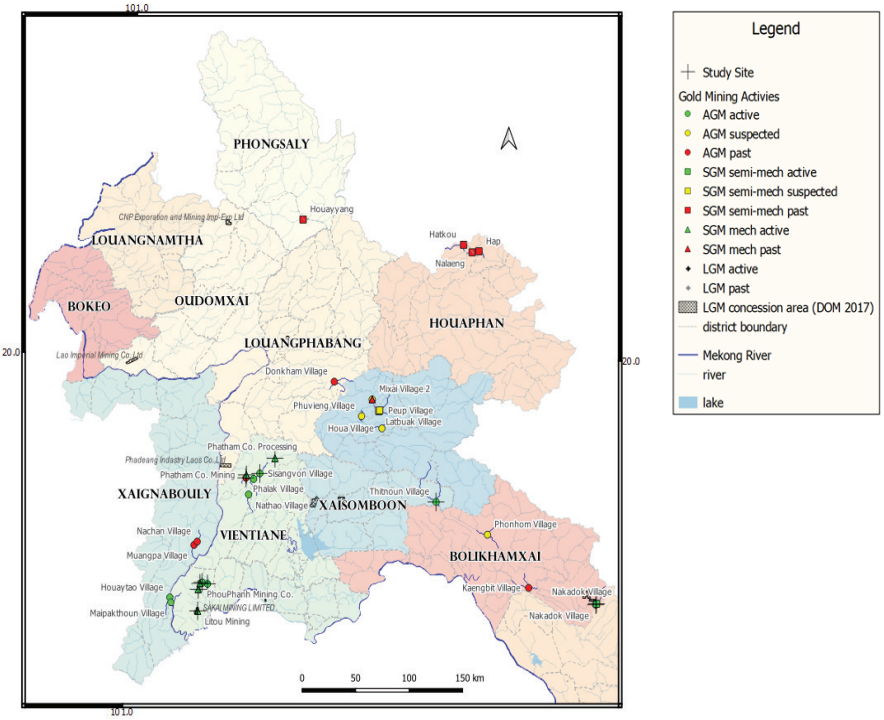

Figure 1. Gold mining activity map of Northern Lao PDR including artisanal gold mining (AGM,) small-scale gold mining (SGM), and large-scale gold mining (LSM)

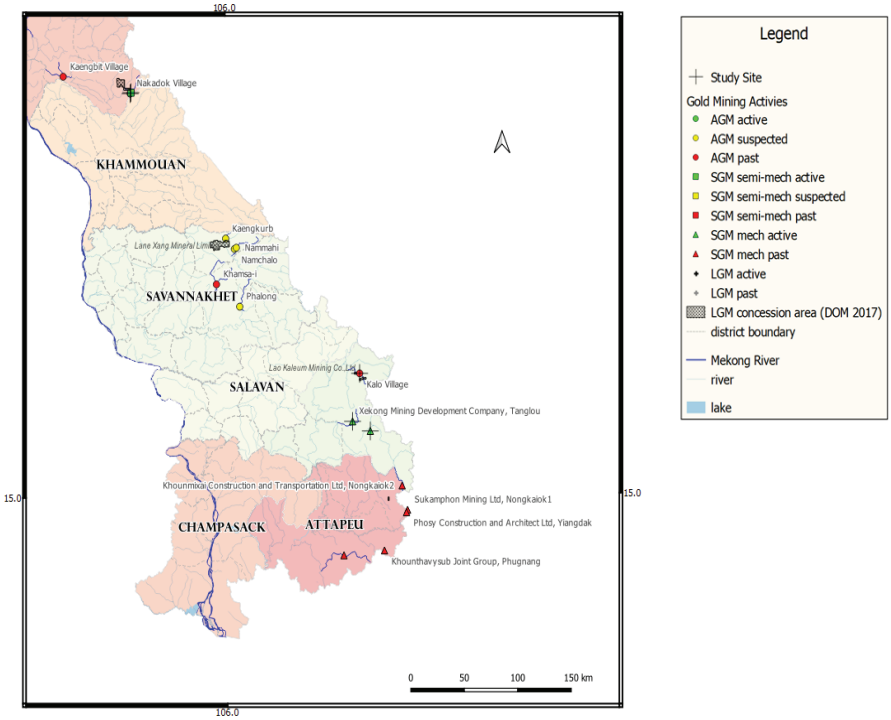

Figure 2. Gold mining activity map of Southern Lao PDR including AGM, SGM, and LSM



3.3 Mining and processing information

In Lao PDR, two kinds of ASGM activity are recognised, which are divided into three technology categories (manual, semi-mechanised, and mechanised), as described in the table below.

Table 1. Categories of ASGM production and mechanisation employed in the Lao PDR ASGM baseline study

Category of ASGM	Level of mechanisation
Artisanal gold mining (AGM) (traditional mineral panning) *Ore extraction and processing are manual. Processing is done by panning; using primitive and traditional tools, such as pans, hoes, spades and/or shovels; and daily ore throughput per miner is relatively small compared with SGM.*	**Manual** *Ore extraction and processing are done manually using traditional tools, such as pans, hoes, spades and/or shovels.* *e.g., extracting ore with rock picks (hard rock), baskets, and shovels (soft rock); and processing with hammers (grinding hard rock) and panning (soft rock and ground hard rock).*
Small-scale mining (SGM) *Ore extraction and processing exhibit varying degrees of mechanisation and may use chemical substances. Ore throughput per miner is larger than an AGM operation but far smaller than an LSGM operation.*	**Semi-mechanised** *Ore extraction and processing incorporate both mechanised and manual techniques* *e.g., extracting ore as a slurry with a mechanical pump and then panning or sluicing.*
	Mechanised *Ore extraction and processing are done entirely by mechanised systems.* *e.g., extracting ore with a jackhammer or excavator and processing via mechanical crusher, mill, and shaking table and/or chemical leaching.*

The methods used by the ASGM communities of Lao PDR to extract and process ore vary greatly within the country. During the baseline study, it was noted that factors exhibiting high variability between ASGM sites included the size of the working area, scale of ore production and throughput, level of group organisation, and technologies and methods employed, amongst others.

Traditional panning is the most widespread activity and is usually practised in the streams and rivers of nearby communities, although the sediments of flooded rice paddies are occasionally also panned. In general, panners recover flake gold that does not require further concentration through mercury amalgamation, although historically, mercury was widely used by traditional panners.

Amongst semi-mechanised gold operations, a great variety of techniques are used, many of which involve pumps that are used to extract a gold-rich slurry from open pits dug by hand or excavator and flooded. The pumps move greater quantities of ore through sluice circuits, and the gold concentrate collected in the mats of the sluices is then panned by hand.

Mechanised operations also vary greatly from one to another. Excavators and rock hammers are used to exploit both hard rock and soft rock deposits. A variety of crushers and mills have been observed in use to reduce ore size and liberate gold particles. Some mechanised sites use multiple sluice circuits and shaking tables to further concentrate the ore before leaching the concentrate using a variety of media, including cyanide and hypochlorite.

3.3.1 Minamata Worst Practices

There are four worst practices identified in the Minamata Convention for mercury use in ASGM. All countries developing national action plans are required to take steps to eliminate these practices. All four worst practices have been reported in Laos, as described in table 2.

Table 2. Minamata worst practices observed in Lao PDR

Minamata worst practice	Occurrence in Lao PDR
1. Whole ore amalgamation	This is practised by some SGM operations, although the scope of the practice is unknown. Specifically, mechanised operations have been observed crushing and grinding ore and then passing the whole ore over mercury-charged copper plates installed on sluices.
2. Open burning of amalgam or processed amalgam	Although some SGM operations were observed using retorts, in general, retorts or vapour capture tools were neither observed or reported at most SGM and all AGM sites visited. It is believed that most amalgam is burned openly without the use of mercury vapour capture tools.
3. Burning of amalgam in residential areas	Due to the clandestine nature of mercury use and the strong possibility that gold shops amalgamate flake gold to increase purity, it is believed that most burning of amalgam occurs within homes or gold shops and thus in residential areas
4. Cyanide leaching in sediment, ore or tailings to which mercury has been added without first removing the mercury	Cyanide leaching of mercury-contaminated tailings was both observed and reported at SGM sites across the country. Specifically, cyanidation of both primary ores and tailings that had been subject to whole ore amalgamation via mercury-coated copper plates was observed. Many other instances of SGM operations using both mercury and cyanide in their processing were reported, although not corroborated. At least one hard rock AGM site is suspected of adding potassium cyanide to ground ores prior to amalgamation with mercury.

3.4 Baseline estimates of the amount of mercury used in ASGM

Several lines of evidence indicate that mercury has been used and continues to be used in some AGM and SGM operations of Lao PDR. Interviews with government officials and gold traders, as well as field visits to ASGM zones, confirmed the use of mercury in certain AGM and SGM operations. However, the illegality of mercury use in the country presents a difficulty in determining an accurate baseline number because miners do not feel safe speaking openly about or demonstrating mercury use.

According to the baseline study, a minimum of 2,258 kg/year of ASGM gold (100% pure) is produced in Lao PDR, and 94 – 365 kg/year of mercury is used[6] annually by the sector. It must be emphasized that these are considered absolute minimum estimates since many reports of unlicensed SGM operations that have relatively large levels of ore throughput and mercury use have not yet been verified and therefore do not figure in these estimates. The global average ratio of mercury: gold for concentrate amalgamation was estimated in 1.3:1, however, note that deviations of this value from the true values in Lao PDR may be very large and present a large window of uncertainty on the final mercury estimates. See Annex A for a detailed description of the national baseline and mercury use estimates.

3.5 Legal and regulatory status

3.5.1 Legal and regulatory status of the ASGM sector

While the Lao PDR has a long history of traditional artisanal and small-scale gold mining (ASGM), panning began to expand and intensify in many areas in the mid-1970s and became a widespread activity by the 1980s (approximately 10-40 g/person/year)[7]. It continued to grow in workforce, gold production, and mercury use up to its peak during the years 2005 to 2012[8]. On June 11, 2012, Order of the Prime Minister No. 13/PM was issued to *"suspend consideration and approval of new investments for exploration and mining of minerals, rubber plantation, and eucalyptus plantation across the country."* In the year following the order, Governors of the provinces issued letters terminating all ASGM activities. According to ministry officials, the Prime Minister's Order caused a rapid decline in ASGM activities throughout the country, but as monitoring was not documented, it is not known to what extent.

In 2017, the Lao PDR Law on Minerals[9] was amended to include provisions for specific regions to practice Traditional Mineral Panning. Traditional Mineral Panning is defined by Article 85 of the Lao PDR Law on Minerals No. 291/POR, 2017. Article 86 outlines the formal protocol for its management:

Article 85 (New 2017) Traditional Metallic Mineral Panning: Traditional metallic mineral panning is mineral panning by using primitive and traditional tools, such as pans, hoes, spades, and/or shovels, without using any type of chemical substances.

6 Whereby "mercury used" denotes mercury lost to the environment.

7 Global Mercury Project. (2003). *Removal of Barriers to the Introduction of Cleaner Artisanal Gold Mining and Extraction Technologies in Pak Ou and Chomptet Districts. Lao PDR*

8 Based on the estimated 7000 tons (in 2005) – 6500 tons (2012) before the announcement of Decision on suspension of granting approval for mineral and rubber & eucalyptus plantation prospection and exploitation to new investors by the Lao government. Treated from https://www.ceicdata.com/en/indicator/laos/gold-production.

9 Lao PDR Law on Minerals No. 291/POR. Decree of the President of Lao People's Democratic Republic on the Promulgation of the Law on Minerals (Amended Version). Vientiane Capital, 3 November 2017.

Article 86 (New 2017) Management of the Traditional Metallic Minerals Panning: The Provincial and Capital Departments of Energy and Mines, District, Municipality and City Offices are responsible for the management of traditional metallic mineral panning. Traditional metallic mineral panning (or artisanal gold mining) is specifically granted to Lao citizens residing in the relevant village areas. The energy and mines sector, in collaboration with the line ministries and local administrative authorities concerned, is in charge of issuing the regulations on the management of traditional metallic mineral panning from time to time, including the monitoring of their implementation.

3.5.2 Legal and regulatory status of mercury use

The official Decision on the National Environmental Standard (2017)[10] regulates limited emissions and releases of mercury from the industrial sector; however, mercury releases from the ASGM sector are not mentioned. This gap is addressed in part by the Environmental Protection Law[11] (Articles 34, 35, and 36 of the Environmental Protection Law also regulate mining operators' obligations involving pollution control, measures, and general toxic chemical control regulations) and the Law on Minerals for Lao PDR. The Environmental Protection Law requires mining operators to develop an action plan for controlling pollution and containing toxic chemicals that are harmful to human health and the environment through the use of appropriate technology, disposal practices, and monitoring.

Regarding the establishment of a coordinating mechanism, after the ratification of the Minamata Convention on Mercury[12], the Government of Lao PDR adopted the Minamata Initial Assessment (MIA) and National Action Plan (NAP) for the ASGM Project. As a Party to the Convention, Lao PDR has an obligation to take steps, as outlined in Article 7 of The Convention, to reduce, and where feasible eliminate, the use of mercury and mercury compounds in the ASGM sector. The Government of Lao PDR (GoL) established an implementation committee to facilitate these Convention obligations through Ministerial Decision No.5056/MONRE, dated 30 October 2017.

With respect to the Minamata Convention, institutional roles are the following:

Ministry of Natural Resources and Environment: Develop legislation, policies, and an action plan to satisfy all requirements of Convention Article 7. Also, steward and monitor mercury-use data and relevant information.

Ministry of Energy and Mines: Develop a legal framework for the recommendations put forward by the NAP. Since AGM is a cultural practice that takes place informally in remote places, and much of the country is remote and sparsely populated, practices are difficult to control. Therefore, the formalisation of AGM may be considered.

10 MONRE (2017). National pollution control strategy and action plan 2018 – 2025 with vision to 2030. Prepared by the Ministry of Natural Resources and the Environment with technical support from Greater Mekong Subregion Core Environment Programme, Vientiane.

11 The Environmental Protection Law No. 29/NA, 18 December 2012.

12 Chapter XXVII – Environment, 17. Minamata Convention on Mercury». UN Treaty Collection. *Accessed at:* https://treaties.un.org/doc/Treaties/2013/10/20131010%2011-16%20AM/CTC-XXVII-17.pdf. *Retrieved 31 May 2019.*

Table 3, below, outlines the laws of the Government of Lao PDR that are relevant to each step of Article 7 of The Convention.

Table 3. Lao PDR laws relevant to the commitments as a Party to the Minamata Convention on Mercury

Article 7 – Artisanal and small-scale gold mining	Lao PDR	Comments
Take measures to reduce, and where possible, eliminate mercury and mercury compound use, emissions (to air), and releases (to land and water) associated with ASGM.	Environmental Protection Law: Article 34, 35, and 36.	Need to develop regulations and laws for eliminating whole ore amalgamation, open burning of amalgam or processed amalgam, burning of amalgam in residential areas, and cyanide leaching of mercury-laden sediment, ore or tailings.
Establish a coordinating mechanism and delineate agency roles for the development/implementation of an ASGM National Action Plan (NAP).	Established after Lao PDR ratified the Minamata Convention.	This gap is addressed in this NAP, and regulations applicable to this issue should be developed.
Eliminate whole ore amalgamation, open burning of amalgam or processed amalgam, burning of amalgam in residential areas, and cyanide leaching of mercury-laden sediment, ore or tailings (the "worst practices").	No law or regulation addresses this issue in Lao PDR at this time.	This gap is addressed in this NAP, and regulations applicable to this issue should be developed.
Set mercury reduction goals or targets consistent with the timely elimination of worst practices and other mercury-use reduction efforts.	No specific goals and targets remain to be set.	Goals and targets are established in this NAP.
Reduce mercury emissions, releases, and exposures associated with ASGM and prevent mercury exposure of vulnerable populations (particularly women of child-bearing age and children).	No law or regulations directly address this issue in Lao PDR at this time.	Regulations applicable to this issue will be developed through the implementation of this NAP.
Prevent the diversion of mercury and mercury compounds from other sectors to ASGM and manage mercury trade consistent with the NAP.	No law or regulations directly address these issues in Lao PDR at this time.	Regulations applicable to this issue will be developed through the implementation of this NAP.
Implement a public health strategy to address mercury exposures to ASGM miners and communities.	Article 35 of law on hygiene, disease prevention and health promotion No.73/NA, (2019) and Articles 58, 59, 60, 61 and 62 of law on healthcare No. 58/NA, (2015).	Public awareness programs on the health effects of mercury use in ASGM to vulnerable communities and even ASGM operators are addressed in this NAP.

3.6 Leadership and organisation of ASGM at national and local levels

According to the baseline report, panning villages exhibit no standard formal organisation and rarely, if ever, operate on formal concessions to which they have permits. Traditional panning is seen as an informal but tolerated activity that abides by an array of informal structures and systems of administration. Typically, activities are overseen by the head of the village. In many villages, panners work either solitarily or in family pairs. In villages where the river was far from the community (e.g., Yamchalernxay Village), women work in groups of 5 to 8 for the sake of safety and companionship on the long walk to the worksite. In some semi-mechanised sites, the miners were self-organised into groups of 6 to 14 people, with each group sharing a mine pit, pump, and sluice; and 3 to 4 from each group panning the sluice concentrate at the end of the day. Earnings are split evenly within mining groups in all the villages visited, except for the mechanised operations.

The mechanised operations are licensed operations that function as a business. These mechanised sites are either registered by Lao entities, such as Rural Development Companies, are joint ventures between Lao and foreign business interests, or are foreign-owned, usually by Chinese or Vietnamese entrepreneurs. According to the laws and regulations, these sites are expected to operate on a legal concession with specific concession and investment agreements in place and under the conditions granted in the operational permits, which are the same as those required by LSM. Perhaps due to these licensing requirements, many mechanised sites do not apply for concession rights or permits, for they think it to be a complicated process and are worried that they may not be granted approval when they apply and thus operate illegally. They are organised under the leadership of the mine site owner, overseen by the owner, site coordinators, and mining technicians and run by miner employees. Earnings are structured hierarchically according to employee role.

3.7 Trade and demand of mercury and gold

3.7.1 Mercury trade

Lao PDR neither has any primary mercury mining activity nor mercury-added products manufacture. Some mercury is produced as a by-product of primary metal mining; however, based on the results of the survey, the existing mercury in the ASGM supply chain is imported from neighbouring countries, such as Vietnam, Thailand, and China, through foreign companies investing in small-scale mining activities. Some villagers claim that mercury can be illegally sold by workers who work for large-scale gold mining companies in the form of mercury residues collected from the mining facility. Several villagers reported during the health baseline data collection that foreign mining companies gave them mercury for free and encouraged its use among ASGM miners without ever mentioning potential dangers. Other communities complained of local mines or "illegal ASGM by foreigners" dumping large quantities of chemicals in the forest and rivers.

Some mercury is also made available to miners by gold traders who may use the substance themselves to increase the purity of their gold so that it can be sold at a higher price. Some reports indicate that mercury is provided free of charge to traditional panners by traders. This is plausible given that some traders expressed a preference for gold treated by amalgamation vs flake gold. For mercury sold in bulk, domestic prices were not ascertainable due to a general reticence to speak openly about mercury use; however, anecdotal reports have suggested that mercury is sold domestically for between 100 and 300 USD per kilogram.

3.7.2 Gold trade

Artisanal miners typically sell their gold product to local gold traders who live in the village, external gold traders who come to the village to conduct business (and often offer a better rate than the local buyer), or to a trader in the nearest town. The local traders sell either to the regional markets or to the markets in Vientiane Capital. The regional markets sell to Vientiane Capital. Interviews and observations made by the baseline inventory team indicated that gold buying prices were consistent across the provinces visited, with prices for regional buyers being slightly higher than that of local buyers. The price of gold ranged from approximately 23-36 USD/g (80,000-125,000 LAK/houn[13] with local on-site traders and 30-36 USD/g (105,000-125,000 LAK/houn) at regional shops, and 39 USD/g (136,000 LAK/houn) in Vientiane Capital. It is highly recommended that a dedicated study be performed focussing more thoroughly on gold traders to increase the sample size and to include the large markets in Vientiane Capital. Little is known about the breakdown of ASGM gold sources in Vientiane Capital gold markets, what form it is purchased in (flake, nugget, bullion), and whether the traders or dedicated refiners may use mercury to purify ASGM gold. The ratio of gold sold for domestic use vs gold exported legally or illegally is also unknown.

3.8 Socio-economic aspects

Based on the baseline study information collected from Xaisomboun, Vientiane, Bolikhamxay, and Xekong provinces, the average annual income per miner was found to range from 4 to 158 g of impure gold (3.5 to 150 g of pure gold) per year within the subset of sites visited [in villages of Thidnoun and Yamchaleunxay of Kaleum District, Xaisomboun Province; villages of Lak Sao and Nakadok of Khamkeut District, Bolikhamxay Province; villages of Dak Pong of Dak Cheung District, Xekong Province; and Sisangvone (Kasi District) and Nakang (Sanakham District), Vientiane Province]. These figures are based on miner self-reported figures of ore throughput, grade, and gold production. Considering the gold prices reported by traders in each community, this range of income equates to USD $94 - $4,713 /y, which spans from far below to just over double Lao PDR's average income per capita of USD $2568 (2018). The baseline study reveals that some miners can achieve a far better than average income solely through mining, while others require complimentary income-generating activities to make ends meet. All artisanal miners interviewed in all communities carry out AGM activities as a means of supplementing their primary income, which derives from farming.

3.9 Demographic and social information

The Global Mercury Project conducted a study in Laos in 2003, which found that non-mechanised ASGM activities were reported in eleven (11) of the then seventeen (17) provinces and that roughly 8,000 people or more were involved in ASGM.[14] However, this data was not collected or available in all provinces, so it may not capture the full scale of ASGM activity in Laos. Furthermore, this data is from prior to the 2017 moratorium on all new mining activity, after which it is believed that the number of people involved in ASGM diminished. The areas with the highest intensity of ASGM (in order) were: Bolikhamsai in the Lak Sao area and Attapeu Province along the Sekong River. Bokeo and Luang Prabang were also reported to have a signifi-

13 Houn is a unit of weight used in the measurement of gold weighting among ASGM communities in Lao PDR. 1 gram ≈ 2.6 Houn.

14 Randy Baker, Hermann Wotruba, Erin Aucoin, et al., *Global Mercury Project: Lao People's Democratic Republic (PDR) Final Summary Report,* (Project EG/GLO/01/G34 "Removal of Barriers to Introduction of Cleaner Artisanal Gold Mining and Extraction Technologies," April 2017).

cant, although more seasonal, ASGM sector. A World Bank study conducted by Mitsui Mineral Development Engineering Co. Ltd (MINDECO) estimated that between 7,000 and 15,000 people were involved in ASGM in Laos in 2006. However, recent, reliable data on the exact number of Lao citizens involved in ASGM is not available. According to the baseline study conducted in 2018, a minimum of 2,118 miners forms a primary workforce in the ASGM sector in Lao PDR, although due to the small sample size, it is believed that the actual number of workers is likely to be an order of magnitude higher.

3.9.1 Gender & nationality

In all panning villages and the one semi-mechanised site visited as part of the baseline study conducted in 2018, it was observed that both the male and female heads of the family are carrying out panning activities, and the gender distribution is close to 50/50 (51% women and 49% men according to all panning villages visited in this study). Occasionally children are observed accompanying their parents to the mining sites. The roles of the men and women were similar; both genders undertook the manual excavation of alluvial ore, hauling of overburden, and panning. It is likely that both men and women, including those of child-bearing age, practice unprotected amalgam burning and are exposed to mercury vapours. In the case of semi-mechanised sites, both men and women operated the sluices, although only men were seen operating the subset of pumps viewed. The representation of women on mechanised sites, however, was very low. Across the mechanised sites studied, female representation ranged from 0–1.5%. No children were observed on these sites. The roles of women in these mechanised operations were limited to panning and household duties and not operating machinery. Observations at more villages, particularly regarding gender and mercury use, are required to form a more complete picture of gender roles in the ASGM sector of Lao PDR.

In terms of local/foreign representation among workers, artisanal panning villages tended to be entirely local Lao residents. Fully-mechanised small-scale operations tended to employ mainly foreign workers if the operation was owned by a foreign entity (88-98% foreign workers across foreign-owned operations with Vietnamese citizens making up the majority of foreign workers) and vice versa with Lao-owned operations (e.g., 6% foreign workers at Lao-owned Phatham, Kasi District, Vientiane). Overall, the average proportion of the workforce represented by foreign workers across study sites for AGM was 0% (n=5 survey samples), while SGM was 66% (n=4 survey samples).

3.10 Environmental information

Information on the environmental impacts of ASGM was collected through various channels. One of these channels was direct interviews with stakeholder representatives attending consultations and workshops organised by the NAP project team at selected provinces. Government mining officials at the provincial and local levels (POEM and DGM) reported during stakeholder consultation that local residents sometimes complain about the ASGM activities in their region, claiming that the operations in the past or present have affected the quality of their natural water source by chemical use or siltation, making the water unusable and causing the death of aquatic animals (reported in the Mar, Ou, and Xékong Rivers) and in some cases livestock (reported in Thidnoun Village, Xaisomboun). In Houaphan, many local people complained of the activity of the dredge boat SGM operations during their operation from 2011–2013. Soil erosion and water pollution made the water unusable.

Complaints have also been recorded about ASGM operations in other countries affecting the ecology downstream in Lao PDR. Officials participating in the North-eastern Lao-PDR stakeholder workshop noted

that ASGM sites upstream in Myanmar had been creating water turbidity downstream in Louang Namtha that was negatively impacting local fish populations. In Xékong, officials stated that there are ASGM activities taking place in Vietnam on the Shaman River in Vietnam, upstream of Dakjeung that use mercury and contaminate the waters downstream in Dak Cheung. As a result, the local people of Dak Cheung cannot use water from the Sekhaman River.

In Bolikhamxai Province, ASGM activities were previously practised and might still take place within the Nakai-Nam Theun National Biodiversity Conservation Area (NBCA). Semi-mechanised pump and sluice operations on the Nam Top River adjacent to Nakadok Village appear to have extended into the protected area. Hard rock mining and processing with mercury also occurred within the bounds of the park in the past. Since very few AGM and SGM miners operate on legal concessions, the encroachment of mining activities on protected areas beyond Nakai Nam Theun NBCA is possible and should be a priority for further investigation.

3.11 Health information

3.11.1 Institutional Capacity Assessment

Lao PDR has a low capacity to identify health risks from chronic mercury exposure and to appropriately diagnose and treat acute mercury poisoning. An Institutional Capacity Assessment (ICA) evaluated the current relevant policies and regulatory framework within the Ministry of Health and the knowledge of such policies and frameworks among government officials and healthcare providers at public hospitals at the National, Provincial, District, and Village level in areas known to have an active ASGM sector. Based on this assessment, only 30% of the 20 interviewed health care workers were aware that mercury was used in ASGM and posed an occupational risk to those involved in the sector. Of those who were aware of mercury use, 50% of health workers claimed that they received previous education on mercury poisoning from schools, and 36% received education from government institutions (See Figure 3). The assessment also indicates that a large portion of the interviewed healthcare providers does not have sufficient knowledge and experience to diagnose and treat illnesses linked to mercury poisoning. Health centres generally have no laboratory testing capacity to differentially diagnose mercury poisoning, and Lao PDR currently has no poison control centre.

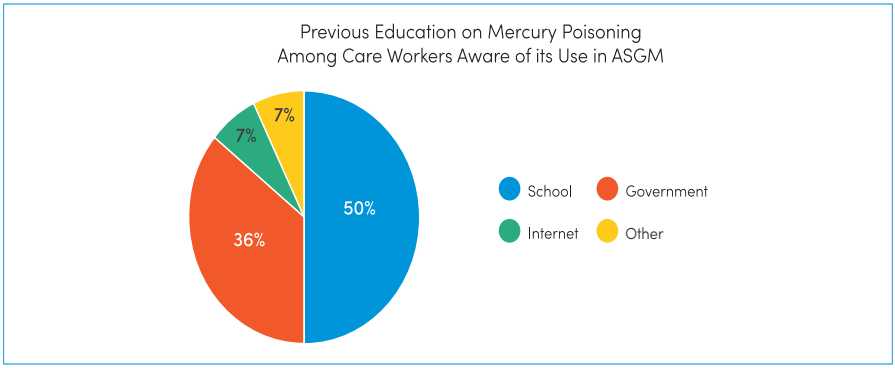

Figure 3. Source of information on mercury poisoning for healthcare workers aware of mercury use in ASGM

3.11.2 Rapid Health Assessment

A Rapid Health Assessment (RHA) was also carried out to inform the NAP by providing an overview of the current health concerns for the ASGM communities surveyed. 129 villagers in 13 surveyed communities from 4 different provinces were interviewed about their health concerns and asked about symptoms and issues known to be linked to mercury poisoning and other detrimental health effects caused by living in areas with mercury contamination. The majority of miners were completely unaware of any dangers linked to mercury use. For the most part, miners self-reported good health; 35% of the interviewed stated that they had fair health conditions, 26% thought that they had good health, and 19% indicated that they had excellent health conditions. On the contrary, 20% of the interviewed villages expressed concerns over their poor health conditions.

Specifically with regard to mercury, qualitative data collected suggests that mercury contamination is likely in many ASGM communities, especially in those communities where villagers consistently stated that they used mercury without protection in, or close to, community water sources and reported common symptoms of mercury exposure or poisoning. Unfortunately, bioindicators of mercury exposure were not collected as part of the rapid health assessment. There is, therefore, very limited quantitative knowledge on the current situation of human exposure to elemental, organic, and inorganic mercury in and around ASGM hotspots.



4 National Objectives and Reduction Targets

Problem Statement

ASGM is an increasingly important economic activity in Lao PDR with the potential to help alleviate rural poverty – in particular as an income supplement for subsistence farming families. However, the use of mercury and other toxic chemicals in ASGM is known to cause health and environmental risks that affect aquatic ecosystems, miners and their families, and local communities. Most miners do not know how to protect themselves from mercury exposure, and the health system is not equipped to diagnose and treat cases of mercury toxicity. Without basic knowledge on safe handling practices, training on mercury-free processing techniques, and effective mercury trade and use regulations, mercury will continue to be emitted and released from ASGM activities in Lao PDR.

Goal

Protect human health and the environment by reducing and eventually eliminating the use of mercury in ASGM through awareness-raising, the introduction of mercury-free gold production technology, and more effective policy and financial supports implemented in collaboration with the relevant stakeholders.

National Reduction Target

Mercury use in the ASGM sector of Lao PDR is primarily an issue associated with mechanised SGM operations, as opposed to individual panners (AGM) who tend to use no, or comparatively small amounts, of mercury. To achieve meaningful mercury reduction, it is these SGM operations that need to be engaged. Lack of awareness, lack of effective mercury-related regulations, and a lack of economically viable mercury-free alternatives are some of the barriers that these operations face.

Addressing these barriers will take time. The national reduction targets are thus divided into short (2020-2023), medium (2024-2026,) and long -term (2027-2030) time scales. The short-term reduction target will rely on the early implementation of mercury education and awareness campaigns. The development of legal and regulatory instruments to manage mercury will result in increased mercury reductions in the medium-term in conjunction with the introduction of mercury-reduced processing techniques. As these techniques gain traction and proliferate, deeper reductions will be seen in the longer term.

The national mercury reduction target for this plan is as follows:

Mercury use and release to the environment from ASGM will be reduced by 20% of baseline[15] levels by 2024, 50% by 2027, and 70% by 2030.

Objectives

Based on the findings from the ASGM Baseline Report 2019, the following objectives are defined to achieve the abovementioned goal and become the core focuses of the National Action Plan:

Objective 1
To effectively reduce mercury use in the ASGM sector by 20% in 2024, by 50% in 2027, and 70% by 2030.

Objective 2
To amend the existing legal instruments and develop mercury-focused regulations with an emphasis on effective law enforcement.

Objective 3
To undertake sound management measures related to mercury trade, in particular illegal trade and diversion of mercury into the ASGM sector.

Objective 4
To iteratively strengthen the institutional capacity to address mercury use at both the central level and local level and to promote the participation of stakeholders in converting to less mercury intensive ASGM practices.

Objective 5
To enhance the public awareness of health and environmental issues related to mercury use in ASGM, particularly amongst women, children, and vulnerable populations.

Objective 6
To develop and implement national policies and incentives that promote mercury-free and sustainable ASGM gold production.

15 Since the current baseline estimates of 94-365 kg of Hg used per year are known to be absolute minimum estimates, the baseline will be revised and a more comprehensive national baseline for mercury used in ASGM will be established by 2022.



5 Implementation Strategy

The following section provides an overview of the major strategies that will be adopted in this National Action Plan. The strategies are organised according to the requirements of Annex C of the Minamata Convention on Mercury. They describe broad approaches to achieving the specific objectives, reduction targets, and the overall goal of this plan. More detailed activities for each set of strategies will be described in section V.2. – Work plan.

5.1 Strategies

a) Actions to Eliminate Worst Practices

Annex C of the Minamata Convention, section 1 (b) lists 4 practices to be eliminated, which include whole ore amalgamation, open burning of amalgam or processed amalgam, burning of amalgam in residential areas and cyanide leaching in sediment, ore or tailings to which mercury has been added without first removing the mercury. According to the information disclosed in the baseline report, whole ore amalgamation is mainly processed by the SGM miners, who sometimes process large amounts of ore through mercury coated copper plates or may use other mercury intensive amalgamation techniques. Cyanide use was not directly observed during field visits, but indications that it is used by some SGM operators to process mercury-contaminated tailings exist. The burning of amalgam is practised clandestinely by SGM and, to the extent that mercury is used in AGM, by artisanal miners as well. Due to the covert nature of this activity, it is suspected that amalgam burning happens privately in homes and without the use of retorts or vapour capture devices.

The following strategies to eliminate the worst practices listed in Section 1 (b) of the Minamata Convention are proposed:

- Gathering more robust information on the scale, extent, and factors contributing to the adoption of "worst practices" in the ASGM sector.
- Promote technical interventions to introduce mercury-free technologies targeted at miners or ASGM operators.
- Development of alternative production models using gravity concentration and lixiviation for minimising the health and environmental impact of mercury in gold production process.
- Prohibit cyanidation of tailings previously treated with mercury through strengthened regulations combined with awareness-raising activities.
- Raise awareness of risks posed by open burning and burning in residential spaces through outreach and awareness activities.
- Develop training on safe retort use targeted at SGM operations known to practice amalgamation.
- Work with gold traders to identify gold produced via amalgamation (sponge gold) and, where appropriate, train them on the proper use of fume hoods.

b) Steps to Facilitate Formalisation or Regulation

In 2017, the Lao PDR Law on Minerals No. 291/POR [16] was amended to include provisions for specific regions to practice traditional mineral panning and thus opened up a pathway for the artisanal end of the ASGM spectrum of activities to operate legally. The Provincial and Capital Departments of Energy and Mines, District, Municipality, and City Offices have overlapping responsibilities for the management of traditional metallic mineral panning. The energy and mines sector, in collaboration with the line ministries and local administrative authorities concerned, is in charge of issuing the regulations on the management of traditional metallic mineral panning from time to time, including the monitoring of their implementation; however, in practice, the actual responsibilities for managing the activity fall to overlapping responsibilities of the Provincial and Capital Departments of Energy and Mines, District, Municipality and City Offices.

Small-scale (ie: semi-mechanised and mechanised mining) falls into a formalisation grey zone as it is not recognised as a mining activity in the amended Law on Minerals. Some of these SGM operations seem to be operating under pseudo-legality, being in possession of permits and having submitted management plans to Energy and Mines officials. Other SGM operations are operating informally, out of sight of government agencies and without operating permits.

Formalisation thus requires recognising the existence of the full scope of existing ASGM practices and developing prescriptive and proscriptive regulations that define the allowed conditions of operation. Formalisation also requires working through the entire gold supply chain to ensure that gold produced from ASGM is traded and exported through transparent and legal channels.

The following steps are proposed to increase the formality of the sector:

- Develop an integrated vision for the ASGM sector in Laos that clearly defines what the future of ASGM should look like and how the activity maps against the overall development goals of Lao PDR.
- Encourage the formation of miners' associations or other groups that can represent miner interests in national decision-making processes by conducting outreach to mining communities and businesses through provincial government offices, organising national-level coordination workshops, and providing training and guidance to miners.
- Engage national stakeholders (including but not limited to men and women miners, government authorities at all levels, traders, and surrounding communities) in the formalisation process
- Act to strengthen legal and regulatory mechanisms that promote responsible social, environmental and commercial ASGM practices based on the gaps identified while developing a national profile of the ASGM sector.
- Review institutional structural, technical, and financial capacity to support formalisation efforts through the provision of enhanced services to formal operations as well as improved monitoring and enforcement.
- Provide technical and financial incentives to encourage greater levels of formalisation and improve formal market access through outreach, provide training and state accompaniment of miners wishing to formalise, investigate the feasibility of a formal state buying gold program, develop a domestic certification standard for responsible gold and improved monitoring and enforcement. This includes incentives that encourage and motivate women entrepreneurs to have easier entry into the formal gold market.

16 Lao PDR Law on Minerals No. 291/POR. Decree of the President of Lao People's Democratic Republic on the Promulgation of the Law on Minerals (Amended Version). Vientiane Capital, 13 December 2017.

c) Strategies for promoting the reduction of emissions, releases, and risks of exposure to mercury

Lao PDR has two distinct ASGM sub-sectors that are treated differently by the mining code and that display differences in terms of gold processing techniques. These are the SGM sector, comprised of mechanised and semi-mechanised operations targeting alluvial and hard rock deposits, some of whom use large amounts of mercury in their production processes, and the AGM sector, which uses non-mechanised gravity concentration on alluvial deposits and currently uses very little mercury in their processes. These two subsectors need distinct strategies aimed at reducing mercury use, in the case of SGM, and preventing the spread of mercury use in the case of AGM.

SGM operations are the largest consumers of mercury in the Lao ASGM sector; however, many SGM businesses operate without licenses and with no oversight by national or local authorities. Ascertaining the full extent of mercury use in this subsector is thus hard to determine. Improving baseline data on the location and practices employed by these operations and improving regulatory oversight is essential to reducing mercury emissions and releases from this sub-sector. The following strategies are proposed:

- Improve baseline data on ASGM gold production and mercury use through regular national inventories conducted as part of the monitoring and evaluation of this national action plan.
- Review and, if necessary, amend the mining code with specific reference to the use of mercury in SGM
- Develop demonstration processing units, with the help of technical partners, that demonstrate responsible and mercury-free business models that can be replicated by SGM entrepreneurs.

Although traditional gold panners generally claim that they do not use mercury in gold production, it is notable that many gold shop owners express their preference for mercury-treated gold for its higher purity. This means that (1) gold traders and shop owners are familiar with amalgamation techniques and (2) that they have a high incentive to perform amalgamation themselves. Hence, to reduce the potential for emissions, releases, and risks of exposure to mercury in the AGM sub-sector, the following two strategies are proposed:

- Immediate measures for reducing emissions and releases through the introduction of training on the safe use of available mercury capture, storage, and recycling equipment to miners, traders, and gold shop owners.
- Develop outreach campaigns targeting ASGM communities, gold traders, and gold shop owners, highlighting the risks of mercury use.

d) Strategies for managing trade and preventing diversion of mercury and mercury compounds

Lao PDR does not produce primary mercury and, despite reports that some mercury produced as a by-product from large-scale mining may be reaching ASGM mercury supply chains, it is believed that most mercury used for ASGM in the territory is imported from neighbouring countries illegally. Lao PDR has limited allowed uses for the mercury trade, and detailed information on how mercury was imported and transported into Lao PDR is scarce. Thus, to manage trade and diversion of mercury for use in ASGM, the following strategies are proposed:

- Revise the existing national laws and regulations, including those on the trade and transport of mercury and mercury compounds, to ensure that such laws and regulations are consistent with Article 3 of the Minamata Convention.

- Develop measures to obtain approval for legal mercury imports for allowed ASGM uses with a phaseout of importation as mercury-free alternatives become more widely adopted.
- Regional investigation of mercury trade volume and routes, both legal and illegal, and its diversion paths to ASGM, including coordination with trade agencies of neighbouring countries.
- Build the capacity of customs officers to identify and track mercury trade along all customs points.
- Work with neighbouring countries through existing regional trade forums and inter-ministerial dialogues to develop integrated mercury trade policies as well as guidelines for the safe handling, interim storage, and long-term disposal of mercury and mercury compounds.

e) Strategies for involving stakeholders in the implementation and continuing development of the plan

Having stakeholders involved in the program implementation and continuous development process is a key factor in ensuring its success. However, currently, there are no formal organisations representing the interests of artisanal miners, small-scale miners, or gold trade stakeholders to consult with and provide a bridge of communication to mining communities and businesses. The following strategies will be adopted for involving the stakeholders in the implementation and continuous development of the National Action Plan:

- Establish a stakeholder advisory committee for the NAP implementation coordinated by MONRE.
- Incentivize participation in the consultation sessions by offering amnesty to miners who share information on mercury use and offering technical training (e.g.: business and organisational training) to participants.
- Encourage nationally owned SGM enterprises who have interests in producing final gold products to join the existing Lao Gem Jewellery Trader Association under the auspices of the Lao National Chamber of Commerce and Industry for more business opportunities.

f) A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury

The recent rapid health assessment, conducted as an enabling activity for the development of this NAP, reveals that mercury-related health and environmental impact assessment studies in Lao PDR are very scarce. Furthermore, the assessment report discloses that the health workers at both the central and local level have very limited knowledge on mercury-related illness diagnosis and treatment methods. This raises the risk that miners and community members living proximally to ASGM sites may be exposed to toxic levels of mercury, either directly or indirectly. Even worse, the chance they will be properly diagnosed and treated is very limited. To reduce such risks, the following strategies are proposed:

- Improve coordination between MoH and MoNRE to carry out health surveillance, environmental monitoring, and information exchange.
- Improve current health and environmental surveillance efforts by conducting biomonitoring and environmental sampling at ASGM sites and including indicators of mercury exposure and contamination in existing health and environmental databases.
- Conduct capacity-building and training for health care workers, particularly those located near ASGM sites, to diagnose and treat mercury-related illnesses.

g) Strategies to prevent the exposure of vulnerable populations, particularly children and women of child-bearing age, to mercury used in ASGM

Women of child-bearing age and children have been identified as populations most vulnerable to the harmful effects of mercury exposure. Although amalgam burning is not openly discussed or observed in Lao PDR, the baseline report suggests that women are involved in amalgamation and acutely exposed to mercury vapour when burning amalgam – a practice that is likely employed in private homes where other family members, including children, are also exposed.

To prevent the adverse health impacts on children and women, the following strategies are proposed:

- Develop awareness-raising campaigns on the harmfulness of mercury exposure to children and women of child-bearing age delivered to communities where ASGM activity is present, in conjunction with local health providers.
- Integrate mercury awareness into gender-based health programs, including child and maternal health services delivered at the community level.
- Revise current laws and regulations for the mining sector to include the prohibition of employing child labour, as well as in any work involving the direct contact of children with toxic chemicals, including mercury.

h) Strategies for providing information to artisanal and small-scale miners and affected communities

The majority of ASGM activity is carried out in rural areas where miners and most ASGM communities lack awareness of the risks posed by mercury exposure and other related chemicals. This lack of awareness is compounded by the clandestine nature of mercury use which is prohibited by law for traditional panning and which is, therefore, a taboo for discussion with public officials, both at the artisanal and small-scale end of the gold-producing spectrum. For this reason, providing reliable and accurate information to ASGM communities and actors requires an emphasis on:

- Better identifying the targeted mining communities and their characteristics, including the many minority groups in Lao PDR who have their own languages, cultural beliefs, and practices that need to be taken into account through a more thorough province-by-province inventory of ASGM.
- Developing an engagement strategy that accounts for the cultural and technical differences between mining groups.
- Developing appropriate messages and information materials in consultation with stakeholders.
- Conducting mercury awareness training and workshops for miners and SGM businesses by engaging the community head/village chief, or even religious leaders, to chair the training for better results of the activities.

Based on experience with a UNIDO developed training manual for artisanal and small-scale gold miners, training needs to be designed with the learning outcomes of the particular audience in mind. They should be focused, use a variety of teaching methods, and should include demonstrations and hands-on learning techniques.

i) Additional strategies, including market-based mechanisms

Lao PDR has a long cultural history of gold appreciation. In some areas, gold is still used as a currency for transactions such as land purchases and debt repayments. In addition, gold ornaments and gifts are highly valued and used for traditional ceremonies or collected privately. Gold is classified by grade or purity in local markets, with higher purities being worth more; however, as of yet, there is no domestic market standard, mechanism, or demand for mercury-free gold.

In order to promote market-based mechanisms in ASGM, one of the biggest challenges the Lao Government faces is to develop regulatory systems that enable the participation of key stakeholders to jointly work together to promote mercury-free gold and gold products in gold buying markets in Lao PDR and on the other hand provide market incentives to both ASM and SGM sectors to gradually shift to mercury-free practices.

On the demand side, the international demand for responsibly produced mercury-free gold (for example, from refiners and jewellers) already exists and is steadily growing. However, much of the gold produced in Lao PDR is consumed locally, and there is, as of yet, no such local demand for mercury-free gold. Efforts to create a traceable domestic supply of mercury gold for domestic and international markets, as well as efforts to raise consumer awareness locally for mercury-free gold, will be pursued as follows:

- Develop and promote a domestic ASGM gold standard (e.g. gold certificate) that can be easily aligned with the responsible sourcing standards that exist in the international market, such as the CRAFT code, the Fairmined standard, etc.
- Provide state-assisted mercury-free gold product marketing incentives, such as value addition through gold jewellery production by ASGM miners, services that match buyers and suppliers, tax incentives, etc.
- Provide business training to miners and investors, focused on business models for responsible mercury-free gold production.



5.2 Work plan

The following work plan is designed and proposed to achieve the various strategies listed in section V.1.

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
a. Actions to Eliminate Worst Practices	**Activity a.1** Improve the national/regional databases of "worst practices" including number of miners and operators involved and their locations and characteristics.		**MONRE*** MEM MOIC MOST	2021-2022	GB; BF/MF; and TP	100,000	Information on locations of worst practice, estimated number of involved miners/communities, technology use by the miners, release of mercury to environment and mapping of those locations.	List of locations and number of miners and operators
	Activity a.2 Conduct workshop to build capacity for regional officers and stakeholders to be involved in the data collection.		**MONRE*** MEM MOIC MOST NUOL MOD	2021-2022	GB; BF/MF; and TP	30,000	Database establishment and management. Involved agencies and stakeholders have a common understanding about the data collection methods, targets and access to the database.	Set up data collection groups, identify involved government agencies, stakeholders, number of workshops and targeted participants.
	Activity a.3 Ongoing database maintenance and update.		**MONRE*** MEM MOIC MOST NUOL MOD	2021-2030	GB; BF/MF; TP; and PS	100,000	Database is well maintained and regularly updated.	Agency in charge of database maintenance and update, number of staff participating, database is accessible to relevant agencies.
	Activity a.4 TOT training workshops to government authorities at central, provincial, district and concerned villages on best practices in the use of vapour capture equipment.	high	**MONRE*** MEM MOIC MOST NUOL	2021-2025 (1-2 times/ year)	GB; BF/MF; TP; and PS	80,000	Trainers are aware of available mercury capture and recycling equipment and using methods	Number of workshops and targeted participants training materials (booklet, posters, pamphlet etc.,)
	Activity a.5 Provide training to miners, villagers and gold traders performing amalgamation with use of mercury capture and recycling equipment.	High	**MONRE*** MEM MOST NUOL	2021-2025 (1-2 times/ year)	GB; BF/MF; TP; and PS	80,000	Miners villagers and gold traders are aware of available mercury capture and recycling equipment and using methods	Number of workshops and targeted participants, training materials (booklet, posters, pamphlet etc.,)

17 * Indicates agency with primary responsibility
18 GB = Government budget; BF/MF = Bilateral and multilateral funding; TP = Technical partners; PS = Private sector

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
a. Actions to Eliminate Worst Practices **(cont.)**	**Activity a.6** Introduce a pilot mercury capture and recycling equipment lending/ renting program at ASGM mining villages	Medium	**MONRE*** MEM MOST NUOL	2021-2025	GB; BF/MF; and TP	50,000	Each mining village has a proper number of mercury capture and recycling equipment stocked for lending and renting	Number of mercury capture and recycling equipment and potential users
	Activity a.7 Development and dissemination of educational materials on personal and community protection from mercury exposure (e.g. safe mercury storing method, recycling, etc.)	Medium	**MONRE*** MEM MOST NUOL	2021-2025	GB; BF/MF; TP; PS	50,000	Educational materials on mercury protective measures in ASGM activities	Types of materials, villages /miners/gold traders or shops visited and distributed
	Activity a.8 Establish land-use policies that prohibit the burning of amalgamation within 100 m of residential areas.	High	**MONRE*** MEM MOST	2021-2023	GB; BF/MF; TP	50,000	Land-use policies that prohibit the burning of amalgamation within residential areas	Land-use policies that prohibit the burning of amalgamation within residential areas approved by relevant authorities and printed in booklet
	Activity a.9 Establish community ASGM processing zones to reduce widespread pollution caused by burning amalgam within residential areas with proper mercury storing and management functions.	Medium	**MONRE*** MEM MOST MAF	2021-2023	GB; BF/MF; TP; PS	180,000	Community zones are identified with proper management rules open for miners to use.	Number of community zone designated, stock of equipment, and available of management rules and potential users.
	Activity a.10 Periodical monitoring of mercury use by ASGM miners and assessment of reduction of mercury use and release in the country.	Medium	**MONRE*** MEM MOST MAF MOD	in 2023, 2025 and 2030	GB; BF/MF; TP	200,000	Monitoring activities lead by key agencies are carried out at least 3 times by 2030.	Monitoring reports indicating estimated mercury use, location, and observed improvement.
	Activity a.11 Develop specific regulations prohibiting the cyanidation of tailings previously treated with mercury and develop an outreach and awareness strategy to inform SGM operators using cyanide-based lixiviation.	High	**MONRE*** **MOJ** MOIC MEM MAF mass organizations[19] and relevant stakeholders	2021-2023	GB; BF/MF; TP PS	50,000	Regulations prohibiting the cyanidation is developed and adopted.	The regulation is published and disseminated to relevant stakeholders. Enforcement of the regulation.

19 *Mass organizations* is a collective term for the Lao Youth Union, Women's Union, and Lao Front for National Development

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
a. Actions to Eliminate Worst Practices **(cont.)**	**Activity a.12** Develop specific regulations prohibiting the practice of whole ore amalgamation and conduct outreach to operations identified as practicing this technique.	High	**MONRE*** **MOJ** MOIC MEM MAF mass organizations and relevant stakeholders	2021-2023	GB; BF/MF; TP PS	50,000	Regulations prohibiting the whole ore amalgamation is developed and adopted.	The regulation is published and disseminated to relevant stakeholders. Enforcement of the regulation.
b. Steps to Facilitate Formalization or Regulation	**Activity b.1** Formulate legal team to review and propose specific amendments to existing regulations on ASGM and mercury management, taking into account gender equity.	High	**MONRE*** **MOJ** MOIC MEM MAF mass organizations and relevant stakeholders NUOL (Faculty of Law)	2021-2023	GB; BF/MF; TP	30,000	Legal team in place and appropriate regulatory framework is effectively enforced.	Regulatory framework
	Activity b.2 Develop legal instruments for increased formalization and better state oversight of the ASGM sector.	High	**MONRE*** **MOJ*** MOIC MEM MAF mass organizations and relevant stakeholders	2021-2023	GB; BF/MF; TP	30,000	Appropriate regulatory framework is effectively enforced.	Regulatory framework
	Activity b.3 Review institutional capacity and identify gaps and resources for enhancing the state's ability to manage the sector and to clarify divisions of state responsibilities.	High	**MONRE*** MOJ MOIC MEM MAF mass organizations and relevant stakeholders	2023-2024	GB; BF/MF; TP	30,000	Capacity gaps are identified and improvement measures are recommended	A review report being approved by involved institutions and stakeholders.
	Activity b.4 Develop and carry out a work plan for stakeholder engagement and participation in the formalization process that is gender equitable.	Medium	**MONRE*** MOJ MOIC MEM MAF mass organizations and relevant stakeholders	2024-2025	GB; BF/MF; TP	30,000	A plan for stakeholder engagement and participation in the formalization process is developed	Approved plan for stakeholders engagement and participation in the formalization process

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
b. Steps to Facilitate Formalization or Regulation **(cont.)**	**Activity b.5** Develop simplified and clearer licensing requirements for ASGM and enforcement compliance.	Medium	**MONRE*** MOJ MOIC MEM MAF Mass organizations and relevant stakeholders	2024-2025	GB; BF/MF; TP	30,000	Guidelines for applying for ASGM licenses.	List of requirements
	Activity b.6 Develop a monitoring and regulation enforcement plan to reduce illegal ASGM activities.	Low	**MONRE*** MOJ MOIC MEM MAF mass organizations and relevant stakeholders	2024-2025	GB; BF/MF; TP	30,000	A plan is proposed	Monitoring handbook
	Activity b.7 Conduct outreach to ASGM communities and businesses to determine if there is an interest in developing ASGM-based associations, cooperatives or other business interest structures.	Low	**MONRE*** MOIC MEM and relevant stakeholders	2025-2026	GB; BF/MF; TP; PS	30,000	Coordination and communication with ASGM communities are carried out. Surveys (if necessary) are conducted.	Communication records; Surveys results are recorded and analyzed)
	Activity b.8 Develop support structures including training materials and institutional accompaniment for formalizing ASGM extraction, production and supply chain groups.	Medium	**MEM/MOIC*** MONRE and relevant stakeholders	2025-2027	GB; BF/MF; TP; PS	30,000	Identifying relevant government agencies in-charge of formalizing ASGM. Provide necessary materials and trainings and technical assistant to the in-charge agency for preparation and reporting and relevant regulation outlining process.	Involved government agencies are appointed; Assistant need are accessed; Training material and necessary assistance are provided.
	Activity b.9 Create a task force to investigate the feasibility of establishing of a Lao PDR state gold buying program to help grow a formal gold trade and export market.	Low	**MONRE/MOIC*** BOL MOIC MEM	2025	GB; BF/MF; TP; PS	25,000	A task force is jointly formed by relevant government agencies to carry out the feasibility study.	A designated task force is formed. A feasibility report is generated. Feedback form relevant GOL agencies is received.

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
c. Strategies for promoting the reduction of emissions, releases, and risks of exposure to mercury	**Activity c.1** Develop a tailings remediation plans and guidance to reduce future contamination and exposure.	High	**MONRE*** MEM MOST MOH MOST NUOL	2023-2026	GB; BF/MF; TP; PS	40,000	Tailing management plan and guidance are in place and effect.	Tailing management plan and guidance are adopted and in effect.
	Activity c.2 Training for mercury capture and recycling from amalgamation with inexpensive and simple technology.	Medium	**MONRE*** MEM, MOST	2021-2023	GB; BF/MF; TP; PS	80,000	Miners and stakeholder are aware of safe mercury recycling methods.	Number of training workshop organized, training materials including poster, booklet, pamphlet etc.
	Activity c.3 Develop handbook for mercury-free techniques with pictorial illustration.	Medium	**MONRE*** MEM MOST MOIC MES NUOL	2021-2022	GB; BF/MF; TP; PS	25,000	Handbook for introducing available technology for mercury-free techniques with pictorial illustration.	The handbook is approved by relevant authority.
	Activity c.4 Promote and disseminate the handbook for introducing available technology for mercury-free techniques.	Medium	**MONRE*** MEM MOST MOIC MES	2021-2022	GB; BF/MF; TP; PS	20,000	Handbook for introducing available technology for mercury-free techniques with pictorial illustration.	Workshops and targeted miners and stakeholders attended the workshops. Handbooks are disseminated key stakeholders.
	Activity c.5 Develop a regular monitoring plan to monitor mercury use in ASGM sector.	Medium	**MONRE*** MOJ MOIC MEM mass organizations and relevant stakeholders NUOL MOD	2022-2023	GB; BF/MF; TP; PS	15,000	Periodical reporting	Investigation report and evaluation report
	Activity c.6 Develop rules and regulations for implementing the mercury management legislation.	Medium	**MONRE*** MOJ MOIC MEM mass organizations and relevant stakeholders NUOL (Faculty of Law)	2022-2023	GB; BF/MF; TP; PS	15,000	Periodical reporting	Number of periodical report

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
c. Strategies for promoting the reduction of emissions, releases, and risks of exposure to mercury **(cont.)**	**Activity c.7** Develop guidelines on monitoring and inspection of mercury use and release in ASGM sector.	Medium	**MONRE*** MOJ MOIC MEM mass organizations and relevant stakeholders	2022-2023	GB; BF/MF; TP; PS	25,000	A sound and easy-to-use guideline is developed	Approved guidelines
	Activity c.8 Establish a technical consulting unit among relevant ministries with contact persons from provincial/local agencies to conduct outreach and provide support to miners or stakeholders to convert to mercury-free techniques.	Medium	**MONRE*** MEM MOST MOIC NUOL	2021-2030	GB; BF/MF; TP; PS	120,000	In-house consultants/ technical persons are assigned and such information are disseminated to villages, and local government agencies where ASGM operations exist.	Information on access to technology, equipment procurement, financial channels are available with the consulting units and being updated from time to time.
	Activity c.9 Establish a mercury-free small-scale gold mining production and demonstration facility to conduct training with SGM operators and investors.	High	**MONRE*** MEM MOST MOIC	2023-2025	GB; BF/MF; TP; PS	200,000	Existing SGM operators can receive newest information or knowhow from the mercury-free SGM production and demonstration facility.	The mercury-free SGM production and demonstration facility is established and opened.
d. Strategies for managing trade and preventing diversion of mercury and mercury compounds	**Activity d.1** Review the existing national laws and regulations including trade and transport of mercury and mercury compounds and modify them to be consistent with the Minimata Initial Assessment recommendations and the Minamata Convention.	High	**MONRE*** MEM MOIC MOF MPWT MOJ NUOL (Faculty of Law)	2021-2023	GB; BF/MF; TP; PS	120,000	Amended laws and regulations including mercury trade and transport.	List of amended / enacted laws and regulations regarding mercury trade and transport.
	Activity d.2 Disseminate the amended and enacted national laws and regulations on the trade and transport of mercury and mercury compounds to all stakeholders.	High	**MONRE*** MEM MOIC MOF MPWT MOJ	2023-2025	GB; BF/MF; TP; PS	80,000	Training on implementing the laws and regulations are organized with proper promotional materials.	Workshops conducted, targeted participants, disseminating materials.
	Activity d.3 Establish a monitoring and evaluation working group comprised of all relevant stakeholders and authorities.	High	**MONRE*** MEM MOIC MOF MPWT MOJ	2021-2023	GB; BF/MF; TP; PS	50,000	A reviewing committee is appointed and working group is set up.	A list of representatives from concerned stakeholders and government agencies are available with proper TOR.

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
d. Strategies for managing trade and preventing diversion of mercury and mercury compounds **(cont.)**	**Activity d.4** Develop regulations that grant special approvals for mercury and mercury compounds import and for allowed ASGM use	High	**MONRE*** MEM MOIC MOF MPWT MOJ	2021-2023	GB; BF/MF; TP; PS	50,000	Regulations are enacted.	The regulation is approved and be able to be taken into forces by designated agencies.
	Activity d.5 Investigation of mercury trade volume and routes both legal and illegal.	Medium	**MONRE*** MEM MOIC MOF MPWT	2021-2023	GB; BF/MF; TP; PS	50,000	The investigation results are well documented with proper supporting information.	Investigation report is complete and approved.
	Activity d.6 Capacity building for customs officers for tracking and stopping illegal mercury and mercury compounds trade at boarders (study tours, exchange program etc.)	High	**MONRE*** MEM MOIC MOF MPWT	2021-2030	GB; BF/MF; TP; PS	100,000	Training workshop and workshop materials developed	Training workshops are conducted and workshop materials are developed and disseminated to the right agencies and authorities.
	Activity d.7 Setting regulations for the domestic management of mercury in the country to prevent unauthorized diversion to the ASGM sector.	Medium	**MONRE*** MEM MOIC MOF MPWT MOJ	2024-2025	GB; BF/MF; TP; PS	80,000	Regulations disincentivize domestic mercury trade	Training workshops are conducted and workshop materials are developed and disseminated to the right agencies and authorities.
	Activity d.8 Work to harmonize mercury trade, customs, enforcement and transport policies with neighbouring countries through high-level bilateral and multilateral dialogue using existing trade and policy forums such as ASEAN, the East Asian Summit, the Laos-Vietnam Inter-Governmental Committee, and the Mekong River Commission.	Low	**MOIC*** MONRE MEM MOFA MPWT	2025-2028	GB; BF/MF; TP; PS	150,000	Establish a taskforce to engage with counterpart from neighboring countries. Develop bilateral mercury trade control policy/ agreement/covenant with neighboring countries such as Thailand, Vietnam, Cambodia and China.	Bilateral mercury trade control policy/agreement/covenant with neighboring countries such as Thailand, Vietnam, Cambodia and China is in place.

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
d. Strategies for managing trade and preventing diversion of mercury and mercury compounds **(cont.)**	**Activity d.9** Establish a national or regional mercury storage facility for seized mercury stocks and develop guidelines for safe handling, transportation, interim storage and agreements for ultimate shipment to safe disposal facilities.	Medium	**MOIC*** MONRE MEM MOFA MPWT	2022-2025	GB; BF/MF; TP; PS	250,000	Set up national/regional committees for seizing illegal mercury from ASGM sector; Appoint a special committee for establishing and managing the mercury storage; A working group to develop guidelines for safe handling, transportation, storage and disposal of mercury.	National /regional committees for seizing illegal mercury from ASGM sector are appointed; National/regional mercury storages are established and ready to use. A governmental agency/ institute responsible for establishing and managing the mercury storage is appointed; Guidelines for safe handling, transportation, storage and disposal of mercury are approved.
e. Strategies for involving stakeholders in the implementation and continuing development of the plan	**Activity e.1** Establish a stakeholder committee for ongoing input on the implementation of the NAP and define its membership, functions and activity scope.	High	**MONRE*** MEM MOIC MOST MOH MLSW	2021-2030	GB; BF/MF; TP;	100,000	A stakeholder committee and its functions and activity scope are identified	The stakeholder committee and its functions and activity scope is approved by the government.
	Activity e.2 Appoint a NAP Secretariat, Steering Committee, and Technical Team to guide the implementation of NAP and coordinate between stakeholders.	High	**MONRE*** MEM MOIC MOST MOH MLSW Mining site community leaders	2021-2030	GB; BF/MF; TP;	300,000	Coordination is assured through a key agency.	The Steering committee is capable to oversee and supervise the implementation of NAP, the Secretariat and the Technical Team; Implementation of NAP and report Committee; The Secretariat's reports on the implementation of NAP against project work plan and perform administration tasks.
	Activity e.3 Develop stakeholder communication networks and channels including the coordination of regular meetings.	High	**MONRE*** MEM MOIC MOST MOH MLSW Mining site community leaders	2021-2030	GB; BF/MF; TP;	40,000	The stakeholder communication network and channels and meeting schedule and its functions is approved by majority of shareholders.	Documents of communication methods, and schedule.

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
e. Strategies for involving stakeholders in the implementation and continuing development of the plan **(cont.)**	**Activity e.4** Develop regular consultation meetings with ASGM community leaders.	Medium	**MONRE*** MEM MOIC MOST MOH MLSW, Mining site community leaders	2021-2030	GB; BF/MF; TP;	80,000	Meetings are organized and implemented.	Number of meeting conducted and meeting minutes are available.
	Activity e.5 Develop regular consultation meetings with gold market operators (e.g. local gold shop owners and gold traders).	Medium	**MONRE*** MEM MOIC MOST MOH MLSW, Mining site community leaders	2021-2030	GB; BF/MF; TP;	80,000	Meetings are organized and implemented.	Number of meeting conducted and meeting minutes are available.
	Activity e.6 Develop regular consultation meetings with AGM and SGM miners and operators.	Medium	**MONRE*** MEM MOIC MOST MOH MLSW Mining site community leaders	Long term	GB; BF/MF; TP;	80,000	Meetings are organized and implemented	Number of meeting conducted and meeting minutes are available
f. A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury	**Activity f.1** Improve the collection of general health related data, including biological testing of ASGM communities and those near or downstream of ASGM sites as part of better ASGM health surveillance.	Medium	**NUOL/MOH*** MONRE MEM MOIC MOD	2021-2023	GB; BF/MF; TP;	400,000	Improved mercury health surveillance	General personal health indicators including mercury concentration levels in urine and hair
	Activity f.2 Develop a database for mercury contamination levels in aquatic animals downstream of ASGM sites.	Medium	**MOH*** MONRE MEM	2021-2030 (at least once every two or three years)	GB; BF/MF; TP;	120,000	Comprehensive data base is developed	Mercury concentration level
	Activity f.3 Develop and maintain a national database on mercury exposure and related illnesses and ensure its accessibility.	Medium	**MOH*** MONRE MEM	2021-2030	GB; BF/MF; TP;	120,000	Comprehensive data base is developed	Various health and mercury concentration of selected sources.

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
f. A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury **(cont.)**	**Activity f.4** Develop a capacity building handbook for health workers on mercury toxicity, exposure pathways, clinical diagnosis, treatment and preventative measures.	Medium	**MOH*** MONRE MEM	2021-2023	GB; BF/MF; TP;	25,000	Comprehensive handbook is developed	Number of handbooks distributed
	Activity f.5 Conduct training to health workers at district and provincial hospitals as well as health centers near known ASGM sites.	Medium	**MOH*** MONRE MEM	2023-2025	GB; BF/MF; TP;	140,000	Health workers are able to communicate mercury risks, exposure pathways, diagnosis, treatment and prevention	Number of trainings and participants.
	Activity f.6 Develop guidance for the safe handling of mercury by miners and occupational safety.	Medium	**MOH*** MONRE MEM	2023-2025	GB; BF/MF; TP;	25,000	Safe handling of mercury is ensured	Guidance document is approved
g. Strategies to prevent the exposure of vulnerable populations, particularly children and women of child-bearing age, to mercury used in ASGM	**Activity g.1** Improve information on ASGM populations and communities to estimate number of child and women with potential exposure to mercury.	Medium	**MONRE*** MEM MOH	2021-2023	GB; BF/MF; TP;	120,000	Comprehensive data base is developed	Social data of ASGM community
	Activity g.2 Develop awareness-raising materials targeting vulnerable populations and disseminate them to targeted ASGM communities and gold sellers.	Medium	**MONRE*** MEM MOH	2021-2023	GB; BF/MF; TP;	30,000	Vulnerable populations are more aware of mercury exposure risks	Awareness-raising materials.
	Activity g.3 Revise current laws and regulations in the mining sector to specify the prohibition of employing child labor as well as in any work involving direct contact with toxic chemicals including mercury.	High	**MONRE*** MEM MOH MOJ MLSW	2021-2023	GB; BF/MF; TP;	30,000	Revised laws and regulations concerning child labor issues in mining sector	Revised and approved laws and regulations.
	Activity g.4 Collaborate with school educational channels to develop a curriculum on mercury exposure that could be taught in selective schools to school-aged children.	Medium	**MONRE*** MEM MOH MOE	2021-2030	GB; BF/MF; TP;	50,000	Awareness-raising materials are available to school aged children	Awareness-raising materials
	Activity g.5 Awareness-raising on the risks of mercury exposure through mass media channels.	Medium	**MONRE*** MEM MOH MOE	2021-2030	GB; BF/MF; TP;	50,000	Increased awareness of mercury exposure risks	Awareness-raising materials

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
h. Strategies for providing information to artisanal and small-scale miners and affected communities	**Activity h.1** Identify targeted ASGM miners & affected communities with detailed social information on those miners for next stage of outreach plan.	Medium	**MONRE*** MEM MOIC MOH MES/ NUOL	2021-2022	GB; BF/MF; TP;	100,000	Outreach can be targeted where information is most needed	List of locations and number of miners and operators
	Activity h.2 Develop an engagement plan for disseminating information to the ASGM miners and affected communities.	Medium	**MONRE***, MEM, MOIC, MOH MES/ NUOL	2021-2022	GB; BF/MF; TP;	40,000	Document of engagement plan details all steps and conditions to be met. Potential stake holders to be involved (miners, village chiefs, district officers etc.,)	Approaching plan with necessary awareness-raising materials.
	Activity h.3 Establish a mercury awareness-raising working group focusing on engaging miners and affected communities.	Low	**MONRE***, MEM, MOIC, MOH MES/ NUOL	2022-2023	GB;	20,000	A communication working group is established with proper approval from the government.	A name list of qualified working group members.
	Activity h.4 Conduct training on engagement methods to the working group for better communication with miners and affected communities.	Low	**MONRE***, MEM, MOIC, MOH MES/ NUOL	2022-2023	BF/MF;	120,000	Working group training in each province is conducted. Training materials are developed and distributed to the trainees.	Number of working group training and list of participants.
	Activity h.5 Establish monitoring system on the effectiveness of communication for behavioural change through baseline and follow-up assessments in ASGM communities.	Low	**MONRE***, MEM, MOIC, MOH MES/ NUOL	2022-2030	GB; BF/MF; TP;	120,000	Monitoring method and criteria/indicators are set.	Monitoring method and criteria/indicators-Monitoring report is produced annually.
i. Additional strategies including market-based mechanisms	**Activity i.1** Assess the current legal/regulatory framework for the need to establish new laws and regulations for promoting domestic mercury-free gold markets.	Medium	**MOIC***, MONRE, MEM, MOH MOJ	2021-2023	GB; BF/MF; TP;	100,000	Laws and regulations reflecting the promotion of mercury-free gold market are amended if needed	Laws and regulations are approved by relevant authorities.
	Activity i.2 Feasibility study on creating mercury – free gold demand and market in Laos.	Medium	**MOIC***, MONRE, MEM	2021-2022	GB; BF/MF; TP;	75,000	Feasibility report including strategies and action plan and associated budgets are estimated.	Feasibility report is approved by relevant authorities.
	Activity i.3 Training for ASGM miners for producing and marketing mercury-free gold jewelry/souvenir or decoration products.	Low	**MOIC***, MONRE, MEM	2022-2023	GB; BF/MF; TP;	100,000	Training plan and targeted trainees are identified. Training curriculum and needed materials are prepared.	Number of trainings and trainees attended.

Strategy Group	Actions	Priority	Activity lead[17]	Timeline	Funding source[18]	Activity cost (USD)	Expected results	Indicator
i. Additional strategies including market-based mechanisms **(cont.)**	**Activity i.4** Training for provincial and district authorities in industry and commerce sector in conducting business matching for ASGM miners' products.	Low	**MOIC*,** MONRE, MEM, MOH MES/ NUOL	2022-2023	GB; BF/MF; TP;	100,000	Training plan and targeted trainees are identified. Training curriculum and needed materials are prepared.	Number of trainings and trainees attended.
	Activity i.5 Feasibility study for developing a gold standard certificate for responsible artisanal gold production and certification mechanism.	Low	**MOIC*,** MONRE, MEM, MOH MES/ NUOLMOST	2022-2023	GB; BF/MF; TP;	80,000	Feasibility report including implementation agencies is designated; strategies and action plan and associated budgets are estimated.	Feasibility report is approved by relevant authorities.
	Activity i.6 Trial of implementing gold standard certificate (including mercury and other harmful chemicals-free gold) systems with SGM and AGM gold miners and traders.	Low	**MOIC*,** MONRE, MEM, MOH MES/ NUOLMOST	2024-2030	Government - GB; BF/MF; TP; PS	100,000	Implementation agencies are appointed and formed; certificates for gold products from voluntary ASGM miners and gold traders are given	Number of certificates given to gold traders or ASGM miners.
	Activity i.7 Feasibility study for developing economic incentives (tax incentives) for mercury and other harmful chemicals-free gold production.	Low	**MOIC*,** MONRE, MEM, MOF	2022-2023	GB; BF/MF; TP; PS	80,000	Feasibility report including implementation agencies is designated; strategies and action plan and associated budgets are estimated.	Feasibility report is approved by relevant authorities.
	Activity i.8 Trial of implementing economics incentives (tax incentives) for mercury and other harmful chemicals-free gold production.	Low	**MOIC*,** MONRE, MEM, MOF	2024-2027	GB; BF/MF; TP; PS	100,000	Mercury free gold production is encouraged through tax benefits	Types of incentives introduced.
	Activity i. 9 Promotion activities or advertisements on gold certificate systems are carried out through mass media channels, near gold markets and among different levels of government agencies relating to ASGM.	Low	**MONRE*,** MEM, MOIC, MOH MICT	2024-2025	GB; BF/MF; TP; PS	100,000	Information on gold certificates are channeled to producers	Advertisements are made and promotion materials are available and distributed.
	Activity i.10 Feasibility study is carried out on developing a clean investment mechanism (revolving fund, credit scheme, investment matching scheme) for the purchase of mercury-free gold equipment.	Low	**MONRE*,** MEM, MOIC, Commercial banks	2023-2025	GB; BF/MF; TP; PS	25,000	The feasibility study is carried out to access the possibility and opportunity as well as needs for developing the financing mechanism	A feasibility report with thorough findings and suggestions is endorsed.



6 Evaluation Mechanism

A systematic monitoring and evaluation (M&E) framework, will enable the agencies directly responsible for implementing the NAP to determine progress towards achieving the goal, reduction targets and objectives of this plan. Without such a framework, the implementation agencies will not be able to continuously and effectively ensure resources are mobilized to carry out the work plans as scheduled and evaluate the effectiveness of the measures taken. Therefore an evaluation unit will need to be appointed to closely follow up on the progress of NAP and provide reporting systems to inform the achievements of the NAP over time.

The M&E unit shall have tasks to coordinate, develop and establish the monitoring & evaluation framework by coordination with all relevant ministries, provincial and local authorities and other stakeholders of ASGM. The unit will also establish the M&E guidelines, a database for indicator tracking and reporting templates to be used by implicated agencies. The six primary objectives of this plan (Section IV: National objectives and reduction targets) will form the basis of the M&E evaluation framework and are as follows:

Objective 1
To effectively reduce mercury use in the ASGM sector by 20% in 2024, by 50% in 2027, and 70% by 2030.

Objective 2
To amend the existing legal instruments and develop mercury-focused regulations with an emphasis on effective law enforcement.

Objective 3
To undertake sound management measures related to mercury trade, in particular illegal trade and diversion of mercury into the ASGM sector.

Objective 4
To iteratively strengthen the institutional capacity to address mercury use at both the central level and local level and to promote the participation of stakeholders in converting to less mercury intensive ASGM practices.

Objective 5
To enhance the public awareness of health and environmental issues related to mercury use in ASGM, particularly amongst women, children, and vulnerable populations.

Objective 6
To develop and implement national policies and incentives that promote mercury-free and sustainable ASGM gold production.

Each of the abovementioned objectives is associated with the strategy groupings listed in Annex C of Minimata Convention. In order to monitor and evaluate whether all the set objectives are effectively achieved, the following table links the strategy groupings from Annex C with the six primary objectives of this NAP and identifies the indicators that will be used to measure outcomes for evaluation purpose.

Table 4. Objectives, strategies and primary indicators for monitoring and evaluation

Objective/target	Strategies	Indicators
Objective 1 To effectively reduce mercury use in ASGM sector by 20% in 2024, by 50% in 2027 and 70% by 2030.	**a.** Actions to Eliminate Worst Practices	• National mercury use and gold production estimates • Mercury capturing and recycling equipment are being used • Regulations on banning worst practice
	c. Strategies for promoting the reduction of emissions, releases, and risks of exposure to mercury	• Designation of ASGM gold processing zones in ASGM sites • Mercury hotspots management and warning systems are set • Number of miners/operators who shift to use mercury recycling tools • Handbook for disseminating mercury-free technology is developed and distributed to miners • Regular monitoring and inspection plans are developed
Objective 2 To amend existing legal instruments and develop mercury focused regulations with an emphasis on effective law enforcement.	**b.** Steps to Facilitate Formalization or Regulation	• Legal instruments for ASGM management are in place and functioning • Stakeholders are effectively involved in ASGM management and decision making processes • Number of legally operating ASGM associations or businesses.
Objective 3 To undertake sound management measures related to mercury trade (particular illegal trade) and diversion of mercury into the ASGM sector.	**d.** Strategies for managing trade and preventing diversion of mercury and mercury compounds	• Legal instruments review and amendment for prohibition and special permission for mercury trade • Database on mercury trade • Mercury trade (particularly illegal trade) countermeasures are in place
Objective 4 To iteratively strengthen institutional capacity to address mercury use at both the central level and the local level and to promote the participation of stakeholders in converting to less mercury intensive ASGM practices.	**e.** Strategies for involving stakeholders in the implementation and continuing development of the plan	• Stakeholder committee for ASGM is established and functioning • Regular consultation meetings are organized • Steering Committee and Technical Team meetings are organized regularly • Reporting systems to the NAP Secretariat are established.

Objective/target	Strategies	Indicators
Objective 5 To enhance public awareness of health and environment issues related to mercury use in ASGM, particularly amongst women, children and vulnerable populations.	**f.** A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury	• Data & information on ASGM miners and potentially impacted communities are collected and analyzed • Mercury related environmental data is collected and updated • Capacity building for health workers is conducted • Educational handbook and guidance for handling with mercury are published and distributed
	g. Strategies to prevent the exposure of vulnerable populations, particularly children and women of child-bearing age, to mercury used in ASGM	• ASGM involved population information is collected and periodically updated • Awareness-raising programs are designed and implemented • Child labor issues in ASGM are monitored • Awareness-raising activities are carried out through various channels including school, mass media and public signage.
	h. Strategies for providing information to artisanal and small-scale miners and affected communities	• ASGM miners and communities regularly exposed to mercury or mercury contaminated sources are identified • Engagement plan is developed • Awareness-raising unit is established and trained • Miner behavior-monitoring is carried out.
Objective 6 To develop and implement national policies and incentives that promote mercury-free and sustainable ASGM gold production.	**i.** Additional strategies including market-based mechanisms	• Law and regulation for promoting mercury-free gold market in Lao PDR is review and enacted • Feasibility study for promoting mercury-free gold market is carried out acted upon • Stakeholders and key authorities are well informed and trained for participating in the mercury-free gold market • Gold standards certificating systems are developed and introduced to gold producers • Economic incentives for mercury-free gold market promotion are implemented and adjusted to fit actual situation and demand



7 Annexes

7.1 Terms of reference of the working group

Terms of reference for the working group including names and contacts of members.

Executive agency: Pollution Control Department, MONRE

1	Mr. Lonkham Atsanavong	Director General of Pollution Control and Monitoring Department, MONRE Main duty: Overseeing the implementation of the project and report the project results to MONRE. Email: lonkham.atsanavong@gmail.com
2	Mr. Sivannakone Malivarn	Deputy Director of Pollution Control and Monitoring Department, MONRE. Main duty: National Project Coordinator Email: sivannakone@gmail.com
3	Mr. Somsanouk Phommakhoth	Director General of Chemical and Waste Management Division, Department of Pollution Control and Monitoring, MONRE. Main duty: Liaison Officer to facilitate the communication between the project team with local counterparts and key stakeholders; reporting directly to the Project Coordinator. Email: somsanoukphommakhoth@gmail.com
4	Mr Khonkeo Kingkhambang	Deputy Director of Chemical and Waste Management Division, Department of Pollution Control and Monitoring, MONRE. Main duty: Liaison Officer to facilitate the communication between the project team with local counterparts and key stakeholders; reporting directly to the Project Coordinator. Email: khonekeoit@yahoo.com
5	Ms. Latthida Phannavong	Project Administration and Finance Main duty: To assist with administration procedure and facilitate smooth communication between project team and Department of Pollution Control and Monitoring; and to arrange financial resources to support the implementation of the project. Email: nlatthida@gmail.com

Pursuant to Ministerial Decision on The National Steering Committee on Development of Minamata Initial Assessment (MIA) and Updating of National Action Plan (NAP) for Artisanal and Small Scale Gold Mining in Lao PDR, No. 505/MONRE, dated 30 October 2017, a steering committee, technical team and project secretariat were officially appointed by Minister of MONRE. Following is a summary of members of the steering committee, technical team and the secretariat.

Steering committee

1	Mdm. Sisouphan Louanglath (replaced former Director General of DCP. MONRE, Mr. Khamphan Nanthavong for Mr. Khamphan is retired)	Director General of Pollution Control Department, MONRE **Main duty:** Advisor and Team Leader. **E-mail:** sisouphanh2002(at)yahoo.com
2	Mr. Sivannakone Malivarn (replaced Mr. Khamphan Nanthavong, Deputy Director of Pollution Control Department for he is out of duty at MONRE for health and other personal reasons).	Deputy Director General of Pollution Control Department, MONRE **Main duty:** National Project Coordinator and Convener and Sub-Leader **E-mail:** sivannakone(at)gmail.com
3	Ms. Bouakham Sulivan	Deputy Director of Planning and Cooperation Department, MONRE **Main duty:** Member
4	Mr. Siphandone Vilayhack	Deputy Director of Mineral and Geographic Department, MEM **Main duty:** Member
5	Dr. Phanoun Phougmany	Deputy Director of Hygiene and Health Promotion Department, MOH **Main duty:** Member
6	Lieutenant General Khonnoun Vongxay	Deputy Director General of Chemistry Department, MOD **Main duty:** Member

Main duties and expected outputs:

- To recommend and oversee the operations of committees on the project implementation;
- To report the project implementation progress to Minister of MONRE, UNEP and ACG every six months;
- To keep track the implementation of the technical team and secretariat; and
- To chair or co-chair any technical meeting relating to project operation and management.

Technical team

1	Mr. Phengkhamla PHONVISAI, Ph.D	Director General of Pollution Control Department, MONRE **Main duty**: Team Leader **E-mail**: phonvisai(at)gmail.com
2	Mr. Keosankhum Phummaseng	Director of Waste Management Division, PCD , MONRE **Main duty**: Member **E-mail**: sivannakone(at)gmail.com
3	Mr. Vanxay Phoimanivone	Director of Hazardous Chemical Management Division, PCD, MONRE **Main duty**: Member
4	Mr. Phandary Keophilavanh	Director of Budgeting for Investment Division, Department of Finance MONRE **Main duty**: Member
5	Ms. Davong Oumavong	Director of Women Development Division, Lao s Women Union **Main duty**: Member
6	Mr. Athilack Oudumdeth	Director of Labor Protection Division, Lao Labour Federation Union **Main duty**: Member
7	Phaathie Sanaphum	Director of Division Department of Law and Convention, MOFA **Main duty**: Member
8	Dr. Vanseng Chunlamany	Acting Head of Faculty of Chemistry, NUOL Member **Main duty**: Member
9	Mr. Vonephasao Oraseng	Deputy Director of Division Depart of Environmental Quality Promotion, MONRE **Main duty**: Member
10	Mr. Sisthideth Numthaxay	Deputy Director of Division Natural Resources and Environment Institute, MONRE **Main duty**: Member
11	Ms. Phaleema Sisaikeo	Deputy Director of Division, Depart of Import and Export, MOIC **Main duty**: Member
12	Vayakone Sisavath	Deputy Director of Division, Depart of Industry and Handicraft, MOIC **Main duty**: Member
13	Police Colonel Sulixay Xayalath	Deputy Director of Division, Depart of Environment Police, MOPS **Main duty**: Member
14	Ms. Sikaiphet Sengmany	Deputy Director of Division Cabinet of Lao Youth Union **Main duty**: Member
15	Mr. Yer Lobearyao	Deputy of Division, Department of Ethnic Groups, Lao Front Development Union **Main duty**: Member

16	Ms. Manilay Suvannalath	Deputy Director of Division, Depart of Mining MEM **Main duty**: Member
17	Dr. Simonekeo Sansathi	Vice Dean of Social Science Faculty, NUOL **Main duty**: Member
18	Dr. Daovone Keomany	Vice Dean of Environmental Science Faculty , NUOL **Main duty**: Member
19	Mr. Vongsipasack Vongincome	Technical staff, Depart of Water Resources, MONRE **Main duty**: Member
20	Mr. Xaysongkam Sukathammavong	Technical staff, Depart of Planning, MPI **Main duty**: Member
21	Ms. Sirikham Phanhthavong	Technical staff, Department of Multi Party, Lao National Assembly **Main duty**: Member

Main duties and expected outputs:

- To collect data and provide the data and information related to one's organization to the the Project Secretariat;
- To attend consultation workshop on the Draft of Minamata Initial Assessment (MIA) and Updating of National Action Plan (NAP) for Artisanal and Small Scale Gold Mining in Lao PDR;
- To report the project implementation progress to the Secretariat and Steering Committee; and
- To comply with assigned responsibilities from the steering committee.

Project Secretariat

1	Mr. Keosangkhom PHOMMASENG	Director of Division, Waste Management Division, PCD, MONRE **Main duty**: Head of Secretariat
2	Mr. Khuansamai Silapheth	Deputy Director of Waste Management Division, PCD, MONRE **Main duty**: Deputy Head of Secretariat
3	Ms. Thidalath Vongxaya	Technical Officer, PCD, MONRE **Main duty**: Member
4	Ms. Lodchana KHAMMANIKHOTH	Technical Officer, PCD, MONRE **Main duty**: Member

Main duties and expected outputs:

- To summarise and file all materials and documents related to the project;
- To develop work plan and relevant budget for carrying out project activities;
- To coordinate and organize consultation workshops and make comments on the draft of Minamata Initial Assessment (MIA) and National Action Plan (NAP) for Artisanal and Small Scale Gold Mining in Lao PDR;
- To report the results of project implementation and progress of each activity to the Steering Committee; and
- To exercise all rights and obligations assigned by the Steering Committee.

7.2 Detailed national baseline analysis

Methodology

From November 2017 to April 2018, mercury inventory consultants made field visits to 40 mining sites located in 11 provinces. Among the mentioned 40 sites, it was reported that 32 sites were no longer active at the present time. In December 2018, the PCD in collaboration with the AGC expert conducted field revisits to the remaining active 8 operating mining sites located in Vientiane, Xaisomboun, Bolikhamxay and Xekong provinces. Given the difficulty of obtaining reliable information on panning yield and mechanised operation production, the final estimation of gold production and mercury use was based on information collected from 19 sites (9 AGM/10 SGM). Nine of the 10 SGM sites have been kept anonymous to protect informers of illegal mercury use).

Based on the field visits, a draft of national baseline report on ASGM in Lao PDR was made available to inform the Lao PDR National Action Plan (NAP) under the Article 7 of Minamata Convention on Mercury[20]. The baseline report gives an overview of current ASGM practice an activity and in each province of Lao PDR. Furthermore, trade of artisanal gold in 3 markets provinces of Vientiane, Xaisomboun and Bolikhamxay is briefly touched and the mercury use in ASGM was eventually estimated. Based on this baseline report and feedback from interviewed stakeholder, a number of recommendations for NAP were summarized.

Estimation of gold production

The annual gold production of an ASGM site can be estimated via data collected by physical measurements and interviews with miners, leaders and members of the ASGM community, and gold traders. The data collected from miners on their various operations is then extrapolated to the site scale using information about the site. The method may differ on each site depending on the type of data available. Confidence in the estimate can be strengthened by triangulating with site-scale gold production estimated by a local leader and/or mining coordinator or official reports, where available. Some examples of data that may be combined to derive a site-scale gold estimate are:

- the amount of ore excavated daily per miner or machine (t/d), the grade of the ore (g/T), the number of miners or machines (workforce) on site, the number of working days (d/y);
- the amount of gold produced daily per miner or machine (kg/d), the number of miners or machines on site, the number of working days (d/y);
- the amount of gold purchased annually per trader (g/y), the number of traders on the site or in the region;
- the typical income of a miner and the typical revenue distribution structure(s) on site;
- there may be official sources of ore production maintained by government agencies or SGM operators.

Different village may use different method for estimation. Using Nakadok village as an example, ore slurry (ore + water) is pumped over a sluice and the concentrate is then panned to retrieve gold. The magnitude of gold production was determined by averaging robust measurements of the throughput of several sluices. The gold production was estimated using two approaches: (1) with processing site data, and (2) with earnings data. Through cross-checking the two results, one can gain confidence in the resulting estimate.

20 A copy of the baseline report can be made available by contacting the Pollution Control Department.

Processing-based estimate of gold production for Nakadok can use following equations:

Daily ore throughput, sluice (t/d) =
[volume flow rate of slurry (m3/s)[21]] x [amount ore in slurry (g/m3)] x [duration of pumping (s/d)] =
142.6 t ore/d/sluice (average)

Annual ore throughput, site (t/y) =
[daily throughput of sluice (t/d)] x [active sluices] x [active days (d/y)] =
142.6 t/d/sluice x 22 active sluices x 191 active d/y =
599,058 t ore/y/site

Annual gold production, site =
[annual ore throughput, site (t/y)] x [average ore grade g Au/t] x [gold purity (%)] =
599,058 t/y/site x 0.057 g/T x 0.96 =
33 kg pure Au/y/site

The gold production estimate was cross-checked with an earnings-based estimation method, which is relatively straight-forward given that miners earn their income in gold produced by their group, which is split evenly among its members:

Earnings-based estimate of gold production for Nakadok can use following equations:

Annual gold production, site =
[average daily earnings per miner group (g Au/d)] x [gold purity (%)] [number of miner groups on site]
x [active days (d/y)] = 5.6 g/d/group x 0.95 x 30 miners/group x 191 d/y =
30 kg pure Au/y/site

21 volume flow rate of slurry (m^3/s) = [length x width of sluice carpet x depth of slurry (m^3)] / [slurry clearance time of sluice (s)]

Estimation of mercury use

The baseline report confirms that mercury is being used in ASGM to some extent in Lao PDR. However, due to its illegality the prevalence of its use cannot be determined by direct measurement and must be inferred. One way to estimate the amount mercury used by a single panning village is to multiply the (estimated) gold production of the village by the (estimated) proportion of gold produced by mercury amalgamation and the typical mercury-to-gold ratio (units of mercury lost to the environment per unit of gold produced) characteristic of panning. The formula for estimating the mercury use is displayed below:

(1) Mercury use (kg/y) = (gold production (kg/y) x (% gold produced with Hg) x (Hg:Au)[22]

The equation above illustrates that the intensity of mercury use on an ASGM site depends on the Hg:Au ratios of the processing technique, but also on the intensity of gold production. Gold production is in turn influenced by the ore throughput capacity of the site, the characteristics of the ore, and seasonality. For example, a fully mechanised ASGM site may have a smaller Hg:Au ratio than a manual operation if it is able to concentrate ore more effectively. The smaller Hg:Au ration may lead one to think that less mercury is used at this site. However, mechanisation often enables vastly greater gold production for several possible reasons, including a greater ore throughput capacity, the ability to excavate and process high-grade hard rock deposits, and sometimes the absence of a seasonal limitation. If a smaller Hg:Au is applied to a vastly larger gold production results in greater annual mercury use. The annual mercury use of a semi-mechanised operation, meanwhile may fall somewhere between a manual and fully-mechanised operation, as its annual gold production will likely fall between the two. There may of course be exceptions. For example, a village with a large population of panners may have great mercury use than a small mechanised operation or than a large mechanised operation that has replaced some or all mercury use with chemical leaching.

Thus, to understand where the bulk of mercury is being used, one can estimate mercury use via Equation (1), where the sector scoping and field data are used to estimate the value of each variable for each site visited:

- an estimate of gold production;
- an estimate of proportion of gold produced with mercury; and
- an estimate of the Hg:Au ratio for the technology applied.

22 The theory and details of this method can be found in the AGC/UNE ASGM baseline guidebook: O'Neill, J.D. and Telmer, K. (2017). *Estimating Mercury Use and Documenting Practices in Artisanal and Small-scale Gold Mining (ASGM).* Geneva, Switzerland: UN Environment. ISBN 978-0-9939459-7-7. Refer to the guide for more detailed information.

Results

Estimation of gold production and workforce

Of the 69 ASGM sites identified in this study as known or suspected active, (49 AGM/20 SGM), 14 were visited by the ASGM inventory team (5 AGM/9 SGM) and with the assistance of key stakeholder interviews, baseline estimates were made for 19 sites (9 AGM/10 SGM) and one province. The results reported below therefore represent 19 of 49 known or suspected ASGM operations in Lao PDR.

Estimates of ore throughput, gold production (pure) and workforce determined for study sites analysed during the present study.
Sources of data: SV = site visit, KII = key informant interviews, "doc" = formal documentation held by government offices.

ASGM site		Technology category	Ore type	Daily ore processed (t/d)	Daily gold produced, site (g/d/site)	Daily gold produced per miner (g/d/miner)	Annual gold produced, site, median (kg/y/site)	Primary workforce (# miners)	Workforce women (%)	Workforce foreign (%)	Source of data
Thidnoun	AGM	panning	alluvial	884	16	0.7	0.98	280	50%	0%	SV & KII
Yamchalernxay	AGM	panning	alluvial	2	2.8	0.4	0.06	8	100%	0%	SV & KII
Sayjaloon	AGM	panning	alluvial	1	1.8	n.i.	0.04	5	n.i.	0%	KII
Namfoon	AGM	panning	alluvial	n.i.	n.i.	n.i.	n.i.	5	n.i.	n.i.	KII
Sisangvone	AGM	panning	alluvial	114	393	3.7	21	106	50%	0%	SV & KII
Huaypere	AGM	panning	alluvial	n.i.	n.i.	n.i.	n.i.	12	n.i.	n.i.	KII
Phaping	AGM	panning	alluvial	n.i.	n.i.	n.i.	n.i.	12	n.i.	n.i.	KII
ASGM Village 8	AGM	panning	alluvial	74	208	0.4	67	594	50%	n.i.	SV & KII
Xaignbouli Province	AGM	panning	alluvial	n.i.	n.i.	n.i.	n.i.	150	n.i.	n.i.	KII
ASM Hard Rock 1	AGM	manual, hardrock-hg	primary	n.i.	n/a	n.i.	0.01	5	0%	0%	SV & KII
Nakadok	SGM	semi-mechanized	alluvial	3136	169	0.5	31	310	50%	0%	SV & KII
Mechanized Site 1	SGM	mechanized-hg/leach	primary	27	105	n/a	19	100	1%	98%	SV, KII, doc
Mechanized Site 2	SGM	mechanized-*n.i.*	primary	n.i.	33	n/a	6.0	50	n.i.	70%	KII
Mechanized Site 3	SGM	mechanized-leach	alluvial	433	125	n/a	37	34	n.i.	6%	SV & KII
Mechanized Site 4	SGM	mechanized-leach	primary	1856	n/a	n/a	645	150	n.i.	n.i.	SV, KII, doc
Mechanized Site 5	SGM	mechanized-leach	alluvial	200	n/a	n/a	190	n.i.	n.i.	n.i.	SV & KII
Mechanized Site 6	SGM	mechanized-hg	primary	50	100	n/a	12.6	339	1.5%	88%	SV, KII, doc
Mechanized Site 7	SGM	mechanized-leach	primary	≥ 595	n.i.	n/a	532	n.i.	n.i.	n.i.	SV & KII
Mechanized Site 8	SGM	mechanized-leach	primary	≥ 600	n.i.	n/a	763	282	n.i.	n.i.	SV, KII, doc
Mechanized Site 9	SGM	mechanized-*n.i.*	n.i.	n.i.	n.i.	n/a	n.i.	420	n.i.	n.i.	KII
Total of study sites				**6,777**	**-**	**-**	**2,325**	**2,862**	**-**	**-**	
Mean of study sites									**38%**	**26%**	

Estimation of mercury use

The table below presents the mercury use estimates for each village, derived from the above mentioned annual gold production estimates.

ASGM site	Technology	Annual pure gold production (kg/y)	Hg:Au ratio	% Au with mercury (estimated range, miners)	% Au with mercury (estimated range, traders)	Hg use estimated range, miners (kg/y)	Hg use estimated range, traders (kg/y)
Artisanal panners							
Thidnoun	pan	0.983	1.3:1	0	0 – 100	0	0 – 1.3
Yamchalernxay	pan	0.062	1.3:1	0	0 – 100	0	0 – < 0.1
Sayjaloon	pan	0.039	1.3:1	0	0 – 100[23]	0	0 – < 0.1
Sisangvone	pan	21	1.3:1	0 – 100	0 – 100	0.0 – 27.3	0 – 27.3
AGM Village 8	pan	67	1.3:1	0 – 100	0 – 100	0 – 86.7	0 – 86.7
Artisanal Hard Rock miners							
AGM Hard Rock Site 1	grind-Hg	0.012	2:1	100	0	0.024	0
Semi-mechanized operations							
Nakadok	sluice-pan	31	1.3:1	0 – 9	0 – 91	0 – 3.6	0 – 36.7
Mechanized operations							
Mechanized Site 1	leach + Hg	19	4.57:1	100	0	87	0
Mechanized Site 2	n.i.	6.0	n.i.	n.i.	n.i.	n.i.	n.i.
Mechanized Site 3	leach	37	n/a	0	0	0	n.i.
Mechanized Site 4	leach	645	n/a	0	0	0	n.i.
Mechanized Site 5	leach	190	n/a	0	0	0	n.i.
Mechanized Site 6	Hg	12.6	0.40	100	0	7.2	0
Mechanized Site 7	leach	n.i.	n/a	n/a	n/a	n/a	n/a
Mechanized Site 8	leach	n.i.	n/a	n/a	n/a	n/a	n/a
Mechanized Site 9	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Total of all study sites visited		**963**				**94 - 125**	**0 - 153**

* n.i. = not enough information; n/a = not applicable

23 Applying the factors from Yamchalernxay Village, as the panners here expressed the small number of panners present in Sayjaloon conduct their business in the same manner.

7.3 Budget for the implementation of the NAP

Following is a table summarise the total estimated budget need for implementing the NAP in during the period 2020-2030 in order to achieve the national objectives outlined in Section 1. The estimated cost for each strategy is detailed in the work plan.

Strategy Group	Estimated costs (USD)
a. Actions to Eliminate Worst Practices	1,020,000
b. Steps to Facilitate Formalization or Regulation	265,000
c. Strategies for promoting the reduction of emissions, releases, and risks of exposure to mercury	540,000
d. Strategies for managing trade and preventing diversion of mercury and mercury compounds	930,000
e. Strategies for involving stakeholders in the implementation and continuing development of the plan	680,000
f. A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury	830,000
g. Strategies to prevent the exposure of vulnerable populations, particularly children and women of child-bearing age, to mercury used in ASGM	280,000
h. Strategies for providing information to artisanal and small-scale miners and affected communities	400,000
i. Additional strategies including market-based mechanisms	860,000
Total estimated costs	**5,805,000**





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Peace Independence Democracy Unity Prosperity