



Ministry of Environment



UNEP Chemicals Branch

Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining In Cambodia 2012-2016

Prepared by:

The Artisanal and Small Scale Gold Mining (ASGM) Project

Support by:

UNEP Chemicals Branch

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*The **Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM)** was prepared by the Department of Environmental Pollution Control (DEPC), the Ministry of Environment (MOE), with support from the United Nations Environment Program (UNEP). This strategic plan was developed in response to various concerns on safe use and sound management regarding intentional mercury use in Artisanal and Small Scale Gold Mining (ASGM). This SPASGM is also developed and implemented to support existing legal frameworks, national strategies, action plans and many other relevant technical papers. Technical support for this development was administered by the UNEP Chemicals Branch through the **Artisanal and Small Scale Gold Mining (ASGM) Project** with in-kind contributions from the Royal Government of Cambodia.*

This Strategic Plan is published in Khmer and English versions by the Department of Environmental Pollution Control (DEPC), the Ministry of Environment (MOE) of the Royal Government of Cambodia. This is to provide a practical framework on sound management of chemicals, including mercury and mercury containing wastes in Cambodia, with full participation from all levels of Government and civil societies in implementing it.

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Forward

To achieve environmentally sound management of mercury and mercury containing wastes, the Royal Government of Cambodia, through the Ministry of Environment, has been seeking assistance from the United Nations Environment Program (UNEP) to develop a framework for the safe and sound management of mercury and mercury containing wastes in Cambodia. In response to this, UNEP has provided further support to develop a national framework and guidelines for the sound management of mercury and mercury containing wastes, including support for the development of an Action Plan on the Management of Releasing Mercury in Cambodia (2008-2010), Cambodia Mercury Inventory Report (2008), National Mercury Waste Management Plan (2011-2015), and Technical Guideline on Environmentally Sound Management of Mercury Wastes (2011). Recently, in 2010, UNEP has provided both financial and technical assistance for the development of **“Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM), 2012-2016.”**

The **“Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM), 2012-2016** is a management plan for fostering safe and sound management of mercury in order to eliminate the release of mercury at small scale gold mining sites in Cambodia. This means that relevant ministries, institutions, as well as civil society organizations shall implement this management plan in compliance with their own professional standards to contribute to the prevention, reduction, and recovery of mercury, as well as promotion of alternatives to mercury use in artisanal and small scale gold mining, which does not affect economic growth. This strategic plan proposes many activities to solve the problem of mercury use in artisanal and scale gold mining in Cambodia, which embodies institutional capacity, technical capacity, legal framework, public awareness, and prevention of mercury impacts upon human health, the environment, and society at large.

On behalf of the Ministry of Environment, I am deeply grateful to the United Nations Environment Program, which has provided both financial and technical assistance to the ministry in preparing this strategic plan. I also express my great thanks to the national and international experts and all involved officers for their valuable contributions to the preparation of this strategic plan.

Most importantly, I would like to convey my indebted thanks to **Samdech Akka Moha Sena Padei Techo Hun Sen**, Prime Minister of the Kingdom of Cambodia, for his strong support for the environment. I highly appreciate the relevant ministries and governmental staff and stakeholders who have provided strong support and consideration through their comments and advice on the development of the Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM), 2012-2016.

I hope that this strategic plan will facilitate the necessary technical, economical, and environmental actions required for assessing, solving and managing the risk of mercury use in artisanal and small scale gold mining for Cambodia in the future. *DM*

Phnom Penh, Date *16 June* 2011

Senior Minister, Minister of Environment *DM/ek*



Dr. MOK Mareth

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List of Abbreviations

| | |
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| ADB | Asian Development Bank |
| ASGM | Artisanal Small Scale Gold Mining |
| ESM | Environmentally Sound Management |
| GEF | Globally Environmental Facilities |
| MIME | Ministry of Industry, Mines and Energy |
| MOC | Ministry of Commerce |
| MOE | Ministry of Environment |
| MOH | Ministry of Health |
| MOInf. | Ministry of Information |
| MOLVT | Ministry of Labour and Vocational Training |
| NGO | Non Governmental Organization |
| NIP | National Implement Plan for the Stockholm Convention on Persistent Organic Pollutant |
| POP | Persistent Organic Pollutant |
| SPASGM | Strategic Plan on the Management of Mercury in Artisanal and Small Scale Gold Mining |
| STD | Sexually Transmitted Diseases |
| UNEP | United Nations Environment Programme |
| UNIDO | United Nations Industrial Development Organization |
| USD | United Nations Dollar |
| WB | The World Bank |

Executive Summary

The *Action Plan on Management of Releasing Mercury in Cambodia (2008-2010)* was endorsed in August 2008, which illustrated a new effort of the Royal Government of Cambodia to environmentally and soundly manage mercury. This action plan provides a strategic framework for implementation of mercury management within Cambodia's territory, including the development of national targets and timelines for reducing and eliminating anthropogenic sources of mercury, among sectors that use mercury in products and processes or, which generate mercury as a byproduct of a process.

The main goal of the action plan on the management of releasing mercury in Cambodia is to provide the Ministry of Environment with a framework that consists of a way forward in its joint efforts to reduce the exposure of Cambodia's population and ecosystems to mercury use, especially the intentional use of mercury in artisanal and small scale gold mining (ASGM) activities, through the prevention and reduction of anthropogenic releases of mercury to the environment. This action plan identifies initiatives and approaches to reduce the use of mercury in ASGM through various means, including retort technology, mercury recovery and recycling initiatives, alternative technology, etc. for gold miners to follow and adopt. It will be easier to measure success if Cambodia also has sufficient resources to fully implement such initiatives, including the elimination of mercury use in artisanal and small scale gold mining (ASGM) activities.

The Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM) was developed, in response to the commitment of the Royal Government of Cambodia for environmentally sound management of chemicals through a life cycle management approach to mercury and its wastes. There are three main components identified under this strategic plan, which aims to achieve a comprehensive management of mercury in ASGM in Cambodia including:

- (i) Legal framework and institutional building;
- (ii) Research and development; and
- (iii) Awareness raising and communication.

Out of these three components, there are 7 specific objectives and 27 programs of works (proposed activities) that have been identified for sound management of mercury in ASGM

activities. This strategic plan is proposed for implementation over 5 years (2012 to 2016) and requires a budget of approximately **US\$1,807,000.00**. This estimated budget should be allocated as follows: (i) Legal framework and institutional building (**US\$377,000.00**); (ii) Research and development (**US\$685,000.00**); and (iii) Awareness raising and communication (**US\$745,000.00**).

Sources of funding for the implementation of this strategic plan are expected to be obtained from development partners including GEF, UNEP, UNITAR, UNIDO, other UN agencies, WB, ADB, Canada Trust Fund, and others. Besides contributions from these development partners, the Royal Government of Cambodia can also contribute up to 20% (ceiling point) of the total required budgets, either in cash and/or in kind contributions, including office spaces, stores, infrastructure and other miscellaneous items associated with successful implementation of SPASGM.

In conclusion, the Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM) is regarded as a national road map for sound management of mercury in ASGM in Cambodia and the implementation of this strategic plan will be carried out within five years (2012-2016), based on the identified programs of work. The successful implementation of the above-mentioned activities is based on financial support provided by development partners and in-kind contributions from the Royal Government of Cambodia.

1 Introduction and Background

1.1 Introduction

The Governing Council of the United Nations Environment Programme (UNEP), by its decision 24/3 IV on chemicals management, requested the UNEP Executive Director, working in consultation with Governments and other stakeholders, to strengthen the UNEP mercury programme partnerships by taking a number of steps, including enhancing the artisanal and small-scale gold mining partnership. The UNEP Governing Council commitment to the issue of artisanal and small scale gold mining was reinforced by Decision 25/5 on chemicals management.

In that regard, UNEP initiated regional projects in South-East Asia and South America under the Quick Start Programme of the Strategic Approach to International Chemicals Management in cooperation with a number of interested partners. The project will contribute to existing capacity-building efforts to tackle this challenging issue. Similar projects have been initiated in Africa through UNEP and the United Nations Industrial Development Organization (UNIDO) through funding from the United States of America and Finland.

1.2 Background

In June 2006, Cambodia endorsed the National Implementation Plan (NIP) for the Stockholm Convention on Persistent Organic Pollutants (POPs) and this is now under an implementation process. The NIP is the first action plan in Cambodia, which is focused on chemicals reduction and elimination. Then in August 2008, the ***Action Plan on the Management of Releasing Mercury in Cambodia (2008-2010)*** was endorsed. This indicates a new effort of Cambodia to provide additional guidance in the form of specific goals, objectives and actions for sound management of mercury.

The ***Action Plan on the Management of Releasing Mercury*** provides a strategic framework for actions on mercury within Cambodia, including development of national targets and timelines for reducing and eliminating anthropogenic sources of mercury among sectors that utilize mercury in products and processes or, which generate mercury as a byproduct of a process.

The ***Action Plan on the Management of Releasing Mercury*** is to provide a framework for the Ministry of Environment, and a way forward in its joint efforts to reduce the exposure of

Cambodia's ecosystems and especially people, to mercury through the prevention and reduction of anthropogenic releases of mercury to the environment.

The Action Plan on the Management of Releasing Mercury has identified a long-term goal for Cambodia which aims to eliminate the use of mercury consistent with the global trend towards phasing out production and use of mercury. It will be easier and more satisfying to measure success if Cambodia also develops short-term goals, such as eliminating the use of mercury in all products and different sources within three or five years.

The **Action Plan on the Management of Releasing Mercury** has addressed three main objectives as follows:

General Ambient Mercury Objective: Reduce mercury levels in, and fluxes among, selected indicative environmental media in order to approach natural levels and fluxes, thereby preventing or minimizing the exposure of Cambodian ecosystems, fish, wildlife, and population, to mercury levels in excess, being returned to those that can be attributed to naturally occurring levels and fluxes of mercury in environmental media, i.e. natural water bodies mainly Mekong river and Tonle Sap Great Lake.

General Mercury Release Objective: Cambodia recognizes that mercury is a naturally occurring element that can never be eliminated from the environment. The target for reduction is to be achieved through a life cycle management approach, and through the reduction of the number of sources of anthropogenic mercury pollution so as to achieve naturally occurring levels.

General Mercury Use Objective: To reinforce the direction provided in Cambodia's legal framework, in particular the Law on Environmental Protection and Natural Resource Management and sub-decree on solid waste management; sub-decree on wastewater control; sub-decree on air pollution, noise and vibration disturbance; sub-decree on standard and agricultural materials management; we shall consider initiatives, such as promotion and use of products and technologies (i.e. or mercury-free alternative technology) that pose less risk than those used at the present.

In order to achieve the overall objectives addressed above, the Action Plan on the Management of Releasing Mercury has identified 8 key components and 88 program areas for further implementation in order to prevent and possibly eliminate the release of mercury from anthropogenic sources into the atmosphere. The 8 key components are as follows:

-
- Development of Guidelines/Regulations for Major Sources of Emissions of Mercury
 - Capacity Building the Cambodian Mercury Technical Team
 - Comprehensive Inventory on Mercury
 - Mercury Emissions Reductions
 - Mercury Waste Management Approaches
 - Education, Awareness and Communication Best Practices
 - Mercury Monitoring
 - Mercury Research Programs

In addition to the above frameworks, it was understood that the total release of mercury in Cambodia¹ is approximately 14,845 Kg (maximum) per year. The first major source of mercury release into the atmosphere is found to be from consumer products (thermometers and batteries) that cause the release of about 8,485 Kg of mercury per annum, followed by disposal of wastes (dumpsites) that release approximately 4,665 Kg of mercury per year. The third anthropogenic source is gold extraction (small scale gold mining) that releases about 1,182 Kg of mercury into the environment per year, according to inventory report on mercury release in Cambodia (February, 2008).

Based on the guidance framework and the mercury inventory report (2008), a **Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM)** has been developed for environmentally sound management (ESM) of mercury and mercury-contaminated waste generated from artisanal and small scale gold mining activities in Cambodia. This strategic plan promotes the use of alternative substances for gold extraction, the ESM of intentional mercury use, as well as mercury waste minimization and disposal, with provisions for recovering mercury. It will also identify framework needs, risk reduction measures, and potential funding sources to be able to implement, sustain, and expand ESM of mercury waste. Moreover, the plan will reflect the country's national poverty reduction strategies, development plans, or their equivalents.

¹ MOE, February 2008: *Inventory report on mercury release in Cambodia*,

2 National Context Overview

2.1 Situation of Cambodia's artisanal and small scale gold mining

The gold mining industry within Cambodia is currently in a state of transition. Although it is considered to be relatively small by international standards, but the scale and extent of operations are increasing. Sectoral growth has been characterized by an increasing number of miners employed, ever more complex and deeper mine excavations i.e. some up to 80 meters deep, and the introduction of chemical-based gold recovery techniques which represent a movement upwards on the technological change. However, other gold mining activities on rivers or water bodies remain unavailable.

In 1975, twelve gold deposits were known to exist within Cambodia, having been identified by French geologists. Ten gold deposits were located in the western regions of Cambodia, while other two are located in the northwestern. The latter was however comparatively inaccessible as a result of thick jungle and in later years the presence of the Khmer Rouge. However, during the 1980s, the northeastern region was one of the safest in Cambodia, thus being favorable for gold prospectors². Within a few years, seven new significant gold deposits had been discovered by local farmers in the northeastern, instigating a 'gold rush' to the hilly region. There are currently 19 known gold deposits in Cambodia, but none of them are alluvial deposit.

Artisanal and small scale gold mining has become an increasingly important profession in Cambodia from year to year, both for full-time professional migrant gold miners who move from one gold deposit to another, and for local farmers who supplement their income between agricultural seasons. By 2004, it is estimated that between 5,000 and 6,000 people (except family members, i.e. women and children) in Cambodia are employed during the peak mining season, beginning in November and finishing in May, whereby miners mostly work on ore excavation rather than gold extraction due to limited water sources. On the other hand, some migration miners return to their agricultural activities during rainy season, starting from May to November. New mining settlements, whose population can number up to 1,000 people, have appeared close to many major gold deposits. These transformations put pressure on local communities and additional ones on the local environment.

² 2004, Oxfam America. *Small Scale Gold Mining: A situation assessment*.

One of the major differences between the mining industry in Cambodia and those in other countries is the organization of gold mining communities. Gold miners do not work for international companies, but for small local companies, meaning that the artisanal and small scale gold mining sector is gradually increasing in size, due to influence from international companies who obtain licensing for gold exploration and exploitation in some areas and provide backing for those small companies³. There are many independent gold mining individuals and small groups, but it would appear that the number of independent miners is decreasing in the face of increasing control over mining areas by concessionaires, companies, and wealthy miners.

Two types of artisanal and small-scale mining operation are found to be predominantly conducted in Cambodia: open trenching and underground shafting/tunneling. The choice of mining method is dependent on the location with the gold-bearing ore. Pocket-scale mining is also conducted on surface places and shallow deposits, although many of these locations are now exhausted and unprofitable.

Based on the MOE's mercury inventory report 2008, it was understood that mercury releases from ASGM amounted to approximately 1,182 kg per year at maximum. The report also indicated that gold extraction was conducted in a small scale manner or at a family level, and most of gold extraction activities took place in the north-east part of the country.

Until the first decade of the 2000s, the management of mercury and mercury containing wastes in ASGM had not yet been considered by any governmental agencies, and even MOE and MIME which are the most appropriate institutions to handle this issue. So far, the MOE has paid more attention to the management of hazardous wastes generated by the industrial sector, healthcare facilities, and households in cities with high density population. In addition to this, MOE focuses more on policy development, including regulating the collection, discharge, treatment, and/or disposal of mercury and mercury containing wastes (including chemical management and waste handling within facilities). The MIME has been focusing more on regulating mining activities, including gold mining. Nevertheless, regarding artisanal and small scale gold mining activities at a domestic level, the hazardous waste generated from artisanal and small scale mining activities remains unregulated and unmanaged.

³ 2004, *Oxfam America. Small Scale Gold Mining: A situation assessment*

On the other hand, on the issue of mercury use in artisanal and small scale gold mining there are no regulations addressing the prohibition of, nor promoting the environmentally sound use of, such mercury. Therefore, policy and legal instruments for artisanal and small scale gold mining are needed and shall be established to support the livelihood activities of people who are living in the rural areas as well as to address socio-economic and environmental concerns. This policy shall also take into account the current use of mercury in artisanal and small scale gold mining in order to reduce and eliminate the release of mercury from ASGM practices and will include regulations regarding the safer handling of mercury amalgam.

2.2 Challenges in ASGM

Weak or even non-existent regulation enforcement, together with a limited level of professional expertise, has led to the growth of a sector that is increasingly becoming environmentally destructive and hazardous to human health and environment. Based on various studies on ASGM and the impact of mercury on human health and environment (2004-2009), a number of challenges have been identified as follows:

- Gold mining in Cambodia has been characterized in the past as small-scale and low technology mining. Although still small-scale, recent developments have seen the introduction of higher technology gold processing techniques, such as mercury amalgamation and heap leaching cyanidation;
- Severe environmental consequences from heap leaching have been found, particularly as surface water pollution and groundwater pollution, with subsequent ecosystem damage, such as fish kills and the death of wildlife. Human fatalities have also been alleged to have occurred. Pollution originates from the inappropriate disposal of toxic chemical tainted tailings, together with toxic chemical spillage or inappropriate disposal;
- Other significant environmental impacts which have been found as almost resulting from gold mining activity are: deforestation resulting from clearance of mining areas and the demand for timber for housing, fuel, and timber supports for shafts; damaged landscapes that have not been remediated following cessation of mining activity, leaving behind open shafts into which people and animals may fall; and wildlife depopulation as a consequence of increased hunting activity;
- Severe human health hazards have been documented, due to poor practices in chemical processing techniques. No safety clothing is worn and there is little attention to the safe handling of chemicals;
- Remoteness of mining settlements has led to a weak or non-existent health care system, and often a poor diet. Furthermore, food sources, such as fish are potentially contaminated by the chemicals used in mining activities. The non-traditional structure of

mining communities leads to an elevated risk of STDs and HIV/AIDS transmission. Malaria was a serious problem in all mining communities visited;

- Regulation on occupational health safety and environment for ASGM in Cambodia is limited and existing regulations related to occupational health safety and environment have never been applied at those ASGM sites;
- Concepts of health and safety at work are non-existent among the miners. Safety standards are low. Tunnels and shafts have poor ventilation. No miner was observed to wear a helmet. Training on mining is poor and there is a lack of adequately qualified engineers and mining foremen, which is a significant impediment to improving health and safety at work. Some mining fatalities were known to have occurred from the collapse of tunnels and shafts that were inadequately supported;
- There is no information on air quality at artisanal and small scale gold mining sites, regarding to major air pollutants, such as heavy metals, total suspended solids (mercury, lead,) acid deposition (NO_x, SO_x), etc., since no scientific research and monitoring has been so far conducted in this area.

Therefore, there is an urgent need to conduct a field study in advance, to determine the most suitable technologies to promote sustainable actions in this area and to protect human health and environment while still providing income for miners.

2.3 Problematic issues

Generally, artisanal and small scale gold mining in Cambodia is an alternative income generation, beside agricultural activities. Cambodia has previously practiced her own traditional gem stones mining and other valuable stones, despite being in small scale activities and low technology for centuries. Within the last ten years, it has been noticed that advanced technology, machinery and chemicals use have been introduced into ASGM, which encourage migration/seasonal miners to stay and settle down with their jobs more stably at gold mining sites. Such settlement has been ever officially registered or recognized by local authorities, which may have negative effects on income generation of the miners, especially the poor when administration, enforcement or other investment license is applied. Most miners depend very much on ASGM for their main income generation, while the rest (mostly ASGM neighborhood people) do it as alternative income generation, besides their main business activities in agriculture.

Such artisanal and small-scale gold mining contributes to poverty alleviation in the short term period for areas where very few other means of livelihood exist. It also serves as the main source of income for approximately 6,000 people who are living in the north-east and north-

west parts of the country, i.e. Ratanakiri, Mondulkiri, Stung Treng, Kratie, Phrea Vihear, and Oddor Meanchey provinces. Their daily incomes vary from unskilled migrant workers (USD1.5 to USD2.5 per day) to skilled workers who can earn slightly more, and wealthy miners who have their own machinery or excavation earning (USD10 to USD15 per day) more than skilled workers.

Even if ASGM can offer job opportunities and income to the poor, artisanal and small scale gold mining activities still lead to some serious long-term environmental and health impacts on those who are living at, adjacent to, or downstream from operational sites. In this regard, there is a need to promote sustainable practices (i.e. the use of gravity separation and cyanidation, which could be promoted as alternatives to mercury, or mercury recycling technologies such as retorts) at small scale gold mining sites with an aim to protect human health and environment from the negative impacts of mercury and mercury containing wastes while continuing to ensure the income of the miners. The promotion of sustainable practices can be done through legalization and administering of ASGM, and proper professional mining skills for miners shall be provided.

3 Priority Goals and Objectives

3.1 Goals

The overall goal of the Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM) is to provide the Government of Cambodia with a way forward in her efforts to reduce the exposure of Cambodian ecosystems, fish and wildlife, and especially humans, to mercury through the effective management of mercury use in ASGM.

The ultimate goal of the SPASGM is to **reduce and eliminate the use and release of mercury from artisanal and small scale gold mining, in order to protect human health and the environment from adverse impacts resulting from ASGM practices.**

3.2 Priority objectives

In order to achieve sound management and the elimination of mercury release in ASGM, it is necessary to **strengthen institutional capacity, build up the capacity of professional officers to conduct field interventions, and raise the awareness of ASGM communities about mercury risks and provide training on mercury-free processes in order to prevent the release of mercury, reduce environmental pollution, and reduce or eliminate risks associated with ASGM practices through the continued minimization and, if possible, the elimination of mercury use and release from ASGM.**

3.3 Key components of the strategic plan

In order to achieve this goal and the overall objectives above, this strategic plan will develop specific objectives based on the following components of this strategic plan.

- I. Component 1: Legal framework and institutional building
- II. Component 2: Research and development
- III. Component 3: Awareness raising and communication

In order to effectively implement the key components, the Ministry of Environment and relevant ministries and institutions shall develop action plans, based on the available existing capacity and resources, and existing legal instruments in Cambodia. Such activities will be implemented by governmental key players, and stakeholders in both the public and private sector, to achieve the aims and objectives of the set components, as indicated, as follows:

3.3.1 Component 1: Legal framework and institutional building

This component aims to promote policies and programs to reduce and, possibly eliminate mercury trafficking and use in ASGM. The objectives to achieve this component are the following:

- **Objective 1.1: Regulate mercury management and distribution for ASGM.** Recognizing the need to promote the use of voluntary/non-regulatory and regulatory initiatives to minimize and eliminate intentional use of mercury in ASGM.
- **Objective 1.2: Institutional strengthening.** Recognizing that pollution-prevention measures must be adopted, and capacity-building programs will be provided to relevant institutions and professionals working on ASGM issues.

3.3.2 Component 2: Research and Development

There is a need to develop and refine a collective Cambodian capacity and capability to assess exposure and toxicity of mercury in ASGM in order to minimize human health and ecosystem effects through appropriate research, monitoring, modeling, assessment, and inventory programs. Objectives for this component have been set as follows:

- **Objective 2.1: Research mercury-free technologies and promote appropriate technologies to ASGM communities through demonstration and training:** Recognizing the importance of research in mining engineering, alternative technology, and the application of mercury free technology in ASGM in order to eliminate mercury release from this sector.
- **Objective 2.2: Conduct a national inventory of ASGM and create a mercury management database:** Recognizing that standardized and comparable reporting of mercury release and waste management at ASGM is critical to the development of a comprehensive and effective mercury management plan and that a baseline for mercury emissions from ASGM must be established in order to conduct effective monitoring.

3.3.3 Component 3: Awareness raising and communication

There is a need to provide professional skills to gold miners and ore processors on how to apply an appropriate technology which is environmentally friendly and cost effective for

extracting precious metals from primary and secondary ores. Protection of the environment and mitigation of the human health impacts associated with ASGM practices shall also be taken into account. In addition to this, there is a need to educate miners and ore processors on an alternative technology to improve yields from gold extraction processes and to inform mining communities, particularly sensitive sub-groups, such as miners, children, and pregnant women, about human and environmental risks associated with exposure to mercury. The objectives for this component are:

- **Objective 3.1: Vocational training for ASGM communities.** Recognizing that gold miners and ore-processors shall benefit from the transfer of appropriate professional skills in gold extraction through the use of alternative technologies and substances, and the sound use of mercury and wherever possible the continuing minimization and elimination of mercury use in ASGM practices.
- **Objective 3.2: Environmental management training for ASGM communities.** Recognizing the need to establish sound disposal options for tailings and other mining residues to prevent the escape of hazardous materials, including mercury and cyanide from mining sites.
- **Objective 3.3: Awareness raising program for ASGM communities.** Recognizing that diverse gold mining communities need to be made fully aware of human and environmental risks arising from mercury use and its risks.

4 Implementation strategy for 2012-2016

Cambodia acknowledges that releases of mercury use in ASGM pose risks to human health and environment. Thus, the country tries to reduce both of these risks by continuing to reduce, and possibly eliminate mercury use in ASGM through the application of alternatives, based on the following management approaches as stated in the components below.

4.1 Component 1: Legal framework and institutional building

This component aims to promote policies and programs to reduce and possibly eliminate mercury trafficking and mercury use in ASGM.

4.1.1 Objective 1.1: *Regulate mercury management and distribution for ASGM*

Concept:

Recognizing a need to promote the use of voluntary/non-regulatory and regulatory initiatives to minimize and eliminate intentional use of mercury in ASGM.

Activities:

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (USD) |
|-------|--|-----------|------|------|------|------|--------------------------------|------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| 1.1.1 | Review existing regulations to identify acceptable practices for ASGM, and wherever possible, develop new frameworks related to sound management of ASGM | ✓ | ✓ | | | | MIME, MOLVT, MOE, stakeholders | \$20,000.00 |
| 1.1.2 | Develop policy and a regulatory framework that promotes health and safety measures to protect employees and residential areas from the harmful negative impacts of ASGM practice | ✓ | ✓ | ✓ | | | MIME, MOLVT, MOE, stakeholders | \$27,000.00 |

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (USD) |
|-------|---|-----------|------|------|------|------|-------------------------------------|------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| 1.1.3 | Study on current tracking (imports and exports) of mercury materials and compounds for ASGM | ✓ | ✓ | ✓ | ✓ | | MIEM, MOLVT, MOC, MOE, stakeholders | \$45,000.00 |
| 1.1.4 | Regulate the management of mercury trafficking (import and export), including efforts to reduce intentional use in ASGM | | ✓ | ✓ | ✓ | ✓ | MIME, MOLVT, MOE, MOC, stakeholders | \$40,000.00 |
| | Total | | | | | | | \$132,000.00 |

4.1.2 Objective 1.2: Institutional strengthening.

Concept:

Recognizing that pollution-prevention measures must be adopted, and capacity-building programs will be provided to relevant institutions and professionals working on ASGM issues.

Activities:

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (US\$) |
|-------|--|-----------|------|------|------|------|-------------------------------------|-------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| 1.2.1 | Develop capacity-building that meets the long-term needs and priorities of competent authorities to implement the SPASGM | ✓ | ✓ | ✓ | ✓ | ✓ | MOE, MOLVT, MOC, MIME, stakeholders | \$50,000.00 |
| 1.2.2 | Periodically and collaboratively assess the effectiveness of voluntary/non-regulatory and regulatory considerations to further enhance capacities for reducing mercury use in ASGM | | | ✓ | ✓ | | MOE, MOLVT, MIME, MOH, stakeholders | \$20,000.00 |
| 1.2.3 | Set up a database system at central and provincial | ✓ | ✓ | ✓ | ✓ | ✓ | MIME, MOE, stakeholders | \$50,000.00 |

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (US\$) |
|-------|--|-----------|------|------|------|------|--------------------------------------|-------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| | institutions related to miners registration and the application of mercury | | | | | | | |
| 1.2.4 | Organize environmental training for media officers, related to sound management of hazardous materials including mercury | ✓ | ✓ | ✓ | ✓ | ✓ | MOE, MOInf., MIME, press association | \$75,000.00 |
| 1.2.5 | Establish management statistics /data related to ASGM governance. | ✓ | ✓ | ✓ | ✓ | ✓ | MOLVT, MIME, MOE, stakeholders | \$50,000.00 |
| | Total | | | | | | | \$245,000.00 |

4.2 Component 2: Research and development

There is a need to develop and refine a collective Cambodian capacity and capability to assess exposure and toxicity of mercury in ASGM in order to minimize human health and ecosystem effects through appropriate research, monitoring, modeling, assessment, and inventory programs. Objectives for this component have been set as follows:

4.2.1 Objective 2.1: Research mercury-free technologies and promote appropriate technologies to ASGM communities through demonstration and training

Concept:

Recognizing the importance of research in mining engineering, alternative technology, and the application of mercury free technology in ASGM in order to eliminate mercury release from this sector.

Activities:

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (US\$) |
|-------|---|-----------|------|------|------|------|--------------------------------|-------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| 2.1.1 | Search for, test and/or adopt environmentally friendly retorts in the health interests of artisanal miners, and aim to reduce the level of mercury releases into the environment | ✓ | ✓ | ✓ | ✓ | ✓ | MIME, MOE, MVLT stakeholders | \$100,000.00 |
| 2.1.2 | Search for, test and introduce alternative technology, including non-mercury-based technology for miners to follow and adopt | | ✓ | ✓ | ✓ | ✓ | MIME, MOE, Stakeholders | \$80,000.00 |
| 2.1.3 | Adapt the alternative options for sound disposal of tailings and other hazardous wastes from ASGM, and effectively apply the best available options | ✓ | ✓ | ✓ | ✓ | ✓ | MOE, MIME, Stakeholders | \$75,000.00 |
| 2.1.4 | Conduct research on mining engineering to increase gold yields and research on mercury-free technology to reduce mercury requirement by miners | | ✓ | ✓ | ✓ | ✓ | MIME, MOE, MOLVT, Stakeholders | \$200,000.00 |
| 2.1.5 | Develop and implement a demonstration project to promote cleaner production practices, such as the application of retorts, economic instruments, or affordable ore concentrating equipment. | | ✓ | ✓ | ✓ | ✓ | MIME, MOE, Stakeholders | \$80,000.00 |
| | Total | | | | | | | \$535,000.00 |

4.2.2 Objective 2.2: Conduct a national inventory of ASGM and create a mercury management database

Concept:

Recognizing that standardized and comparable reporting of mercury release and waste management in ASGM is critical to the development of a comprehensive and effective mercury management plan and that a baseline for mercury emissions from ASGM must be established in order to conduct effective monitoring.

Activities:

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (US\$) |
|-------|--|-----------|------|------|------|------|-------------------------------|-------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| 2.2.1 | Undertake an inventory on mercury trafficking, use and release from ASGM and make database for further action on mercury use minimization and elimination, if feasible | ✓ | | ✓ | | ✓ | MIME, MOE, stakeholders | \$60,000.00 |
| 2.2.2 | Conduct studies to determine direct and indirect health impacts from mining activities | | ✓ | | ✓ | | MOE, MIME, Stakeholders | \$40,000.00 |
| 2.2.3 | Conduct monitoring activities and document case studies on mercury releases and exposure to the environment at ASGM sites | ✓ | ✓ | ✓ | ✓ | ✓ | MIME, MOE, MOLVT stakeholders | \$50,000.00 |
| | Total | | | | | | | \$150,000.00 |

4.3 Component 3: Awareness raising and communication

There is a need to provide professional skills to gold miners and ore processors on how to apply an appropriate technology which is environmentally friendly and cost-effective for extracting precious metals from primary and secondary ores. Protection of the environment and mitigation of the human health impacts associated with ASGM practice shall also be

taken into account. In addition to this, there is a need to educate miners and ore processors on an alternative technology to improve yields from gold extraction processes and to inform mining communities, particularly sensitive sub-groups, such as miners, children, and pregnant women, about human and environmental risks associated with exposure to mercury. The objectives for this component are:

4.3.1 Objective 3.1: Vocational training for ASGM communities

Concept:

Recognizing that gold miners and ore processors shall benefit from the transfer of appropriate professional skills in gold extraction through the use of alternative technologies and substances, the sound use of mercury, and wherever possible the continuing minimization and elimination of mercury use in ASGM practice.

Activities:

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (US\$) |
|-------|---|-----------|------|------|------|------|-------------------------------------|-------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| 3.1.1 | Develop training and awareness raising materials related to environmentally sound practices for miners and ore processors | ✓ | ✓ | ✓ | ✓ | ✓ | MIME, MOE, MOLVT, stakeholders | \$50,000.00 |
| 3.1.2 | Design and conduct trainings for gold miners and processors on alternative technologies and the safe use of mercury and the application of available technology, i.e. retorts and gravity separation equipment. | ✓ | ✓ | ✓ | ✓ | ✓ | MIME, MOE, MOLVT, Stakeholder | \$100,000.00 |
| 3.1.3 | Organize trainings for miners and processors on sound management of hazardous materials better including safe handling of cyanide and environmental management related to ASGM practices | ✓ | ✓ | ✓ | ✓ | ✓ | MOE, MOLVT, MOH, MIME, stakeholders | \$50,000.00 |

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (US\$) |
|-------|--|-----------|------|------|------|------|--------------------------------|-------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| 3.1.4 | Organize and conduct trainings on occupational health and safety measures for miners and ore processors | ✓ | ✓ | ✓ | ✓ | ✓ | MIME, MOE, MOLVT, Stakeholder | \$150,000.00 |
| 3.1.5 | Organize study visits to share experiences between miners and mining communities in order to eliminate the release of mercury and to increase environmental awareness and safeguards practices in ASGM | | ✓ | ✓ | ✓ | ✓ | MIME, MOE, MOLVT, Stakeholders | \$60,000.00 |
| | Total | | | | | | | \$410,000.00 |

4.3.2 Objective 3.2: Environmental management training for ASGM communities

Concept:

Recognizing a need to establish sound disposal options for tailings and other mining residues to prevent the escape of hazardous materials, including mercury and cyanide from mining sites.

Activities:

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (US\$) |
|-------|---|-----------|------|------|------|------|-------------------------|-------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| 3.2.1 | Set up and conduct regular and systematic samplings of biota and non-biota at all active mining deposits and do analysis | ✓ | ✓ | ✓ | ✓ | ✓ | MIME, MOE | \$60,000.00 |
| 3.2.2 | Put into practice and regularly monitor the environmentally sound management of solid wastes generated from ASGM activities | ✓ | ✓ | ✓ | ✓ | ✓ | MIME, MOE, Stakeholders | \$85,000.00 |

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (US\$) |
|----|------------------|-----------|------|------|------|------|----------------------|-------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| | Total | | | | | | | \$145,000.00 |

4.3.3 Objective 3.3: Awareness raising program for ASGM communities

Concept:

Recognizing that diverse of gold mining communities need to be made fully aware of the human and environmental risks related to mercury use and risks.

Activities:

| No | Program of works | Timeframe | | | | | Responsible agencies | Resources needed (US\$) |
|-------|---|-----------|------|------|------|------|---------------------------------------|-------------------------|
| | | 2012 | 2013 | 2014 | 2015 | 2016 | | |
| 3.3.1 | Organize extension programs related to safe handling , recycling and disposal of mercury for ASGM and effectively implement such programs through outreach activities | ✓ | ✓ | ✓ | ✓ | ✓ | MIME, MOE, MOLVT, stakeholders | \$100,000.00 |
| 3.3.2 | Encourage media to regularly disseminate and broadcast information on the health risks and environmental problems associated with ASGM activities i.e. mercury and other hazardous substances | ✓ | ✓ | ✓ | ✓ | ✓ | MOE, MIME, MOInf, MOLVT, stakeholders | \$60,000.00 |
| 3.3.3 | Organize a forum for communities to share good practices and advanced technology related to sound practices in AGSM | ✓ | ✓ | ✓ | ✓ | ✓ | MIME, MOE, MOLVT, stakeholders | \$30,000.00 |
| | Total | | | | | | | \$190,000.00 |

5 Requirements to achieve the goals and objectives of the strategic plan

5.1 Requirement for resources

In the implementation of this *Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM)*, the total budget needed is approximately **US\$1,807,000.00**. The Government of Cambodia through the Ministry of Environment (MOE), the Ministry of Industry Mines and Energy (MIME), the Ministry of Health (MOE), Ministry of Labor and Vocational Training (MOLVT), and other relevant Ministries will provide national inputs for the effective implementation of the *SPASGM* including: providing direct consultations through the technical departments and national consultants as well as provision of additional technical staff at all levels made available to the ASGM project component for supportive and protective activities related to the timely and effective implementation of each objective. We expect that the government will also contribute up to 20% (ceiling point) of total required budgets respectively, either in cash or as in-kind contributions, such as office accommodation, stores, infrastructure and other miscellaneous items associated with the mercury strategic plan to assist with its successful implementation.

The development partners input will ideally be provided through the Ministry of Environment as a national lead agency on mercury management-related issues. Both bilateral and multilateral assistance can be incorporated into the implementation of this *SPASGM*. The donor inputs for the effective implementation of the strategic plan should be considered and are envisaged to consist of: experts, consultants, administrative support, official duty travel, service contract, general operating expenses, training, supplies and materials, equipment and other miscellaneous items for effective implementation of the plan. The table below shows the proposed budget for implementation of each objective related to the *Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining*.

Proposed Summary Budget for Implementation of the SPASGM 2012-2016

| No | Components/program of works | Resources needed (US\$) |
|-----------|--|--------------------------------|
| 1 | Component 1: Legal framework and institutional building | |
| 1.1 | Objective 1.1: Regulate mercury management and distribution for ASGM | \$132,000.00 |
| 1.2 | Objective 1.2: Institutional strengthening | \$245,000.00 |
| 2 | Component 2: Research and development | |
| 2.1 | Objective 2.1: Research mercury-free technologies and promote appropriate technologies to ASGM communities through demonstration and training | \$535,000.00 |
| 2.2 | Objective 2.2: Conduct a national inventory of ASGM and create a mercury management database | \$150,000.00 |
| 3 | Component 3: Awareness raising and communication | |
| 3.1 | Objective 3.1: Vocational training for ASGM communities | \$410,000.00 |
| 3.2 | Objective 3.2: Environmental management training for ASGM communities | \$145,000.00 |
| 3.3 | Objective 3.3: Awareness raising program for ASGM communities | \$190,000.00 |
| | Total | \$1,807,000.00 |

5.2 Prioritization activities

SPASGM is an action plan designed for 5 year implementation commencing from 2012 to 2016 to achieve sound management and the elimination of mercury release in ASGM. It is necessary to strengthen institutional capacity, build the capacity of professional officers, and raise the level of understanding of miners and mining communities about mercury risks in order to prevent the release of mercury, reduce environmental pollution, and reduce or eliminate risks associated with ASGM practices through the continued minimization and, if possible, the elimination of mercury use and release from ASGM. This strategic plan focuses on three main components divided into 7 specific objectives and 27 programs of works

(proposed activities) and it requires a budget of approximately **US\$1,807,000.00**. This estimated budget should be allocated as follows: (i) Legal framework and institutional building (**US\$377,000.00**); (ii) Research and development (**US\$685,000.00**); and (iii) Awareness raising and communication (**US\$745,000.00**).

Based on resources, institutional and professional factors, the implementation of these component and activities can be divided into three main options as follows:

- **Option 1 (Immediate implementation)**. This option is necessarily to be carried out in the first half five-year action plan that will focus on: Objective 1.1 (Regulate mercury management and distribution for ASGM); Objective 1.2 (Institutional strengthening); Objective 2.1 (Research mercury-free technologies and promote appropriate technologies to ASGM communities through demonstration and training); and Objective 3.1 (Vocational training for ASGM communities). This option provides opportunities for strengthening law enforcement, good governance, institutional building, human resources development, and professional skills of respected target person.
- **Option 2 (Non-immediate implementation)**. This option is necessarily to be carried out after institutional building, human resources development, and professional skill of miners have been strengthened. This option is regarded as the second half five-year action plan implementation that will focus on: Objective 2.2 (Conduct a national inventory of ASGM and create a mercury management database); Objective 3.2 (Environmental management training for ASGM communities); and Objective 3.3 (Awareness raising program for ASGM communities). This option shall be carried out later.
- **Option 3 (Flexible implementation)**. This option shall be carried out, regardless of the consequence of priority activities, nevertheless, it is crucial to implement with flexibilities in order to match with the resources available. This means that this action plan will be implemented in fragmented or random manners, but as a response to the set component and all objectives of this strategic plan.

5.3 Cooperative partners

In the future implementation phase, the Ministry of Environment, with technical and financial support from development partners and the RGC, will work closely with other stakeholders such as: MIME, MoH, MOLVT, MoC, NGOs, Private Companies, etc. to implement this strategic plan. In this regard, the MOE will collaborate closely with MIME in implementing this strategic plan aiming to reduce the intentional use of mercury, and eliminate the release of mercury from ASGM in Cambodia.

5.4 Development partners

This *Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM)* has been developed with technical and financial support from UNEP. Cambodia expects that other actions contained in this plan will also receive support from UNEP and other donor governments as well as the wider donor community such as GEF, WB, ADB, Canada Trust Fund, and others. The Royal Government of Cambodia will also provide some funds through a national budget in order to implement this *SPASGM*.

5.5 Time frames for implementing the strategic plan

This *Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM)* is to be conducted over a five year operational period (2012-2016). The second half of 2012, is the time for Cambodia to prepare this strategic plan and make it ready for implementation. This *SPASGM* has proposed many activities but the operational budget and other resources needed and the potential development partners are unknown. In this case, Cambodia face two main tasks to be done to set the plan in motion: first, the approval of the *SPASGM*; second, starting the funding drive to implement this strategic plan.

In summary, the goals and objectives in the plan and the specific activities and milestones are unlikely to be achieved as scheduled, and this plan will likely be extended for another two or three years as necessary.

6 Evaluation mechanism

Based on the *Strategic Plan on Management of Mercury in Artisanal and Small Scale Gold Mining (SPASGM)*, the Ministry of Environment, through the **“Inter-Ministerial Technical Working Group to Coordinate International Convention and Agreement related to Chemicals”**⁴ will play a coordination role in implementing this strategic plan, in cooperation with between the relevant ministries, institutions and civil society organizations according to its mandate and responsibilities. The MOE will also play a coordination role in organizing technical meetings, conclusion meetings on planning implementation, planning formulation, or project proposal development for implementing the program of works identified in this strategic plan.

In order to review the effectiveness and efficiency of the strategic plan implementation, the MOE and all stakeholders, especially the **“Inter-Ministerial Technical Working Group to Coordinate International Convention and Agreement related to Chemicals”** shall establish two main evaluation mechanisms as follows:

The first evaluation is to be a mid-term evaluation that will be organized in the middle of year 2 or year 3 of this strategic plan implementation, with active participation from all relevant stakeholders to evaluate the outputs, identify the challenges, and set a direction for further implementation.

The second evaluation is to be the total evaluation of the achievements of the strategic plan implementation that will be organized at the end of its implementation phase. Such evaluation can be made, through holding a meeting or a workshop with participation from all cooperative partners, coordination partners, and all stakeholders to evaluate the total achievements as well other positive impacts of this strategic plan. Key points for comparing achievements can be made, through updating such as: the trend of mercury use and release from ASGM; the status of miners understanding related to the use of mercury free alternative technologies; the institutional mechanism established for managing mining communities; as well as reviewing the achievements on the set objectives and the programs of work that are related to reduction and elimination of the use and release of mercury in ASGM in Cambodia.

⁴ MOE declaration No. 405 dated on 22 December 2006.