

Addressing Mercury Pollution in Cambodia's Artisanal Small-Scale Gold Mining Communities

A Final Report

August 2017



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BAN Toxics

BAN Toxics is an independent non-government environmental organization that works for the advancement of environmental justice and health through toxics elimination and the environmentally-sound management of chemicals and wastes, focusing on women, children and other marginalized sectors.

We work closely with government agencies, communities, civil society, and other developmental partners at local, national, and international levels to reduce and eliminate the use of toxic chemicals and support global sustainable development goals through education campaigns, community grassroots interventions, training and capacity-building, policy research and development and advocacy programs.

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RELEVANT ACRONYMS

AIDC	Analyzing Development Issues Centre
ASGM	Artisanal Small-Scale Gold Mining
CSO	Civil Society Organizations
CEDAC	Cambodian Centre for Study and Development in Agriculture
FGD	Focus Group Discussion
Keml	Swedish Chemicals Agency
MoE	Ministry of Environment Cambodia
NTFP	Non-Timber Forest Products
NAP	National Action Plan
Hg	Mercury
UNEP	United Nations Environment Programme

Executive Summary

Background of the Project

This short-term project aims to address Mercury Pollution in the Artisanal Small-Scale Gold Mining (ASGM) Communities in Cambodia through research and baseline data gathering and analyses. Overall, it aims to capacitate community groups and NGOs in Cambodia to work on long-term chemicals management solutions, particularly concerning industrial and consumer chemicals including mercury.

The direct beneficiaries for this project are the ASGM miners (women and men) in one of the ASGM communities in Cambodia, Preah Vihear province. The insights and lessons learned from this study can potentially contribute to assisting local governments and policy makers in developing a deeper understanding of ASGM communities, paving the way for a more inclusive developmental approach in addressing the sector's complex issues and challenges.

Other stakeholders include relevant non-government organizations based in Cambodia, namely: the Analyzing Development Issues Center (AIDC), the Cambodian Centre for Study and Development in Agriculture (CEDAC), Non-Timber Forest Products Organization (NTFP), and other allied NGOs.

The project team employed various qualitative data-gathering methods including key informant interviews, participant observations, and focus group discussions. Other existing documents and records were also collected and compiled such as area profiles, demographics, and previous researches conducted by other scholars and experts in the project area.

Small-scale mining in Cambodia

Large mining companies legally operate 128 concessions around Cambodia. Small-scale mining is also prevalent in different locations around the country. However, because of the informality of this sector, there is hardly any reliable data on the total number of miners in artisanal and small-scale gold mining (ASGM). The Ministry of Environment (2011) estimated that the total number of people directly involved in small-scale mining might be at around 5,000-6,000. However, the prevalence of internal migration and dwindling economic opportunities (key push factors for engaging in ASGM) may actually translate to an actual mining population that is significantly higher than the current estimates. In fact, the Ministry of Environment acknowledged that the high internal migration rate is directly related to increasing number of settlements around gold mining areas.

Cambodia's signing of the Minamata Convention in 2013 signified greater commitment to investing more support in addressing both the issues of ASGM and mercury use in the country.

ASGM Communities in Preah Vihear

Preah Vihear is a province located in the northernmost part of Cambodia, sharing borders with Laos, Vietnam and Thailand. The study covers the mining communities of Trapeang Tem, Phnom Dek Village, and the Rumdeng Village.

During peak mining seasons, the population in these villages increase with an influx of migrant miners and their families coming in for work. Conversely, the population goes down during the rainy seasons, when mining operations cease and migrant miners move back to the communities they were originally from.

The study reveals that most of the mine workers are subjected to harsh working conditions, and are exposed to physical and chemical hazards in the workplace while earning minimal income from their mining activities. In addition, women miners are often placed in a disadvantaged position that deprives them of valuable opportunities for economic and self-development. This mainly springs from the informality of the ASGM sector in Cambodia and the lack of opportunities and support for women and children in these situations. Most often, women work in hazardous conditions in the mining areas and despite their hard work, earning income remains irregular and by chance. Mining essentially does not provide direct compensation for women as derived income mainly goes to family needs.

The ASGM communities are isolated, and health and social protection services are weak. They are also home to some of the worst forms of child labor where children are deprived of their childhoods and exposed to various risks.

The key learnings and highlights identified during the study's implementation period include:

1. ASGM contributes to the local economy and provides livelihood;
2. Women miners are major contributors in the ASGM sector, but face inherent discrimination because of their gender;
3. Mercury use in mining by both the ASGM and large mining companies is prevalent, and poses significant environmental and health risks to adjacent communities;
4. Government support to ASGM communities is lacking, but local governments have the potential to help mining communities overcome the cycle of poverty.

Recommendations

1. Policy interventions are needed to promote the effective management of chemicals such as mercury, as well as to promote safer and more humane working conditions are needed.
2. Research and knowledge gaps must be addressed to further understand the context of ASGM and chemicals management. This can help formulate programs of intervention that are in line with the needs of the mining communities and the environment.
3. Development that targets gender concerns, child labor, working conditions, environment protection, and organizational capacities are needed to empower mining communities especially the marginalized portions of it, including women and children.
4. On handling cases of gender-based violence among women and children in the community, the need to mainstream gender and development in the ASGM sector is important, including the establishment of a clear reporting and monitoring mechanisms, to manage such cases more effectively.
5. Mercury awareness efforts must be conducted to ensure that communities are aware of the dangers of mercury and to help usher in the adaptation of safer alternatives.

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SECTION I: INTRODUCTION

a) About the Project

The project is implemented under the framework of an ongoing regional collaboration, “*Towards a non-toxic South-East Asia*”, that is managed by the Swedish Chemicals Agency.

In its initial phase, the intervention focuses on the ASGM sector, gathering firsthand accounts of the dynamics, issues, and challenges faced by the local communities, and the efforts of the local government agencies and NGOs to address them.

The project’s long-term goal is to capacitate community groups and NGOs in Cambodia to work on chemicals management issues, particularly industrial and consumer chemicals. At the policy level, this project will contribute to providing further understanding of the ASGM landscape; enable other stakeholders such as the national government and local government bodies to identify strategic measures to address mercury pollution in ASGM in compliance with the Minamata Convention; as well as address welfare and development issues of the ASGM communities in Cambodia in accordance with the 2030 Agenda for Sustainable Development.

Direct beneficiaries for this project are the ASGM miners (women and men) of Preah Vihear, the location of one of the biggest ASGM communities in Cambodia. Other stakeholders include relevant non-government organizations, namely: Analyzing Development Issues Centre (AIDC), The Cambodian Center for Study and Development in Agriculture (CEDAC), Non-Timber Forest Products Cambodia (Cambodia), and other allied NGOs.

While acknowledging and lauding the efforts and the interventions addressing mercury concerns that were developed by the Ministry of Environment of Cambodia, a number of implementation challenges were identified. These include the lack of data and information on mercury-related issues, the limited capacity of different relevant institutions, and the lack of public awareness.

b) Objectives and Expected Results

1. To provide a deeper understanding of the extent of mercury pollution brought about by ASGM activities in Cambodia;
2. To build capacities of ASGM miners on Hg-free gold processing methods;
3. To assist the Cambodian government in developing a database on mercury use in the country’s ASGM sector, improve policies on ASGM and mercury, and provide initial inputs to NAP development; and,
4. To capacitate partner NGOs and local government with knowledge of best practices and policy formulation and effective tools and techniques on raising awareness of ASGM communities on mercury toxicity and engaging the public for greater support on the issue.

c) Scope and Limitations

The findings from this report are a product of a series of consultations and field visits. Various qualitative data-gathering approaches were employed, and field visits were conducted in a number of mining sites in Preah Vihear, particularly at the Rom Tum Commune in the Rovieng District through the guidance of local NGO contacts.

For the gathering of data, the team used ethnographic approaches. The team was accompanied by miners, landowners, financiers and women miners to the mining sites to observe daily activities. Each member of the team highlighted and took photos (with permission) of the following activities while going around the mining areas: working conditions, methods used in extracting gold, chemicals used in recovering gold, number of miners on site, mercury use, amount of mercury use, and labor conditions—women and children working on site.

At the onset of the study, initial site visits to mining sites in Mondulkiri, Ratnakiri and Preah Vihear were conducted. Based on this initial assessment, BAN Toxics decided to focus on Preah Vihear for additional interventions. The accessibility of the village, the presence of other relevant development organizations, and the community’s reception to the research team were the major contributing factors to the decision. Succeeding site visits to mining sites and gold processing facilities in the province were conducted from 2016 to 2017.

A key limiting factor for the study is the lack of comprehensive socio-economic data and previous literature on the working conditions and situations of mining communities. Moreover, as ASGM communities operate illegally with no license from the Ministry of Mines and Energy, a significant portion of miners were hesitant to provide information about their operations.

d) Tools and Methodologies

This report mainly uses qualitative tools and methodologies in facilitating data and information collection. These include Key Informant Interviews, Field Visits, Focus Group Discussions, and desk research.

1) Key Informant Interviews

For the Key Informant Interviews, a set of standard questions were formulated by the research team. These include:

- What are the technologies/methods used in extracting gold and processing gold including the use of chemicals?
- Who finances their mining activities?
- Where do they sell the gold?
- Who buys the gold?
- What is the price of gold per gram?
- Where do gold buyers sell their gold?
- Do they make jewelry out of their gold?
- Where are the jewelry makers located? Are they far from the mines?
- Where can mercury be bought from?

Aside from the questions about the nature of the ASGM industry, the key informants were also asked to estimate their daily averages including:

- Estimated average mercury use
- Estimated average gold production (grams/day)
- Estimated number of mine workers

2) Focus Group Discussions (FGD)

Focus group discussions were conducted to draw out issues and challenges confronting ASGM communities in Preah Vihear. These FGDs were used to draw out responses among miners, women, and children, providing valuable insights on their roles in mining and situations they face in the village.

For the selection of participants, a checklist of character traits for each FGD group was formulated. As an example, during an FGD with women, a group of 6 to 8 women engaged in mining were invited to participate. The following characteristics or profiles were employed to select women participants: at least 30 years old; at least 10 years of residency in the community; a mother or a wife; and, has experience in ASGM. This type of profiling helped establish the substance-depth-complexity of the stories and data derived from the narratives and discussions between and among participants.

Selected Participatory Rural Appraisal tools such as historical timeline, village resource mapping, seasonal calendar, wealth ranking and Venn diagram were also used to draw out information creatively during FGDs with children, miners, and women. These supplemented other methods and reinforced other qualitative techniques used during field visits.

3) Documents and Records

Relevant reports, data, and demographics of Cambodia and Preah Vihear were sourced online to supplement information that the team was not able to collect from fieldwork.

SECTION II: CAMBODIA COUNTRY BACKGROUND

a) Geography and Administrative Profile

The Kingdom of Cambodia is a country located in South-east Asia, sharing international borders with Thailand and Lao People’s Democratic Republic to the West and the North, and the Social Republic of Vietnam to the East and the Southeast.ⁱ In total, its land area covers 181,035 square kilometers.ⁱⁱ Administratively, the country is divided into 24 provinces and 4 municipalities.ⁱⁱⁱ

General Information ^{ix}	
Government Type	Parliamentary Constitutional Monarchy
Capital	Phnom Penh
Religion	Theravada Buddhism, Islam, Christianity
Official language	Khmer
GDP (2016 est.)	\$19.37 Billion
Population	16,204,486
Poverty Population (2012 est.)	17.7%

With a mean elevation of only 126 meters, the country is mostly made up of low, flat plains, with mountainous regions in the southwestern and northern parts. The highest point in the country is Phnum Aoral, with an elevation of 1,810 meters.

Cambodia is classified as a tropical country. In terms of climate, the country experiences little seasonal temperature variations. Typically, the dry season occurs from December to April, with rainy, monsoon seasons occurring from May to November.

Historically, Cambodia was seen as a country with limited mineral resources.^v However, numerous explorations have uncovered multiple deposits of oil and gas, gemstones, iron ore, manganese, and phosphates. Additionally, the country has high hydropower potential and is covered with arable land.^{vi}

Cambodia is a Constitutional Monarchy that employs a parliamentary system. This means that the monarch performs ceremonial duties, and may have certain reserve powers as dictated by the constitution. A prime minister is elected and heads the government.^{vii} Since 2004, the country’s Chief of State has been King Norodom Sihamoni. Prime Minister Hun Sen, on the other hand, has been in office since early 1985.

b) Socio-Economic Profile

With an unemployment rate of only about 0.3%^{viii} in 2013, Cambodians generally do not suffer from a lack of employment opportunities. However, official statistics also note that underemployment rates are high – a significant portion of highly skilled Cambodians are estimated to be employed in jobs that pay low wages. Of the country’s working population, about 48% works in agriculture, 20% in industry, and 31% in services.^{ix}

General Information ^x	
Labor Force	6.643 Million (2016 est.)
Main Agricultural Products	Rice, rubber, corn, vegetables, cashew, cassava (manioc, tapioca), silk
Life Expectancy (Male)	62
Life Expectancy (Female)	67.1
Literacy Rate	77.2%

Consequently, these industries also account for most of the country’s main economic drivers – garment exports accounted for a total of \$5.5 billion in direct investments in 2014; real estate construction contributed around \$6.5 billion in 2016; the tourism industry welcomed 4.5 million tourists in 2014;^{xi} and the agriculture industry accounted for 26.7% of the country’s GDP in 2016.^{xii}

For two decades, Cambodia has moved forward with its strong economic growth and has attained a lower middle-income status as of 2015, with gross national income per capita reaching US \$1,070.^{xiii} However, growth remains uneven, and a great divide between rural and urban conditions still exist. About 80% of the population live in the rural areas. Statistics show that around 90% of the poor live in rural areas, resulting in high internal migration. Every year, about 300,000 people from the rural areas move to Phnom Penh and other provinces seeking work.^{xv}

Phnom Penh's population now account for 21% of Cambodia's 15 million inhabitants. In ADB's 2011 report, 42% of the population live on less than \$2 per day and 75% live on \$3 per day.^{xvi}

In terms of ethnic origin, 97% of Cambodians are ethnic Khmer; ethnic minorities include Chinese, Vietnamese, Cham (Islamic), and some 30 hill tribes.^{xvii}

c) The Mining industry in Cambodia

There are 128 mining concessions operating in 18 out of the country's 24 cities and provinces. Together, they cover more than 24,000 square kilometers or approximately 13% of Cambodia.

In recent years, the Cambodian government has pushed for major investments in the mining sector. Based on the data provided by the Ministry of Industry, Mines and Energy (MIME), Cambodia has valuable deposits of copper, gold, iron ore, zinc, lead, tin, bauxite, sapphire, ruby, kaolin, and limestone. However, the lack of geological survey data prevents further analysis, and the potential volume and areas for exploration are yet to be fully analysed.

Currently, there are 19 known gold deposits in Cambodia, none of which are alluvial deposits. The majority of these operations can be classified as small and medium-scale, and virtually no industrial-scale operation exists.

Mineral exploration in Cambodia is funded by both local and international sources. Known funders come from a diverse range of countries including Australia, Korea, China, Canada, America, Japan, and Vietnam. Some of these foreign companies work in partnership with local companies. Cambodian law allows for flexibility in terms of land ownership—wholly foreign-owned mining companies are given licenses and may operate independently.

There is no official figure on the number of miners involved in ASGM. In 2004, it was estimated that there were tens and thousands of people engaged in gold mining; whereas another report pegged the figure at around 5,000 to 6,000 miners. These reports also cited the informality of ASGM activities and noted that majority of these operate

without licenses and use various chemicals, specifically mercury, to extract gold.

In 2011, the Ministry of Environment shared that around 1,000 new mining settlements have been built closer to major gold deposits around the country. With more people opting for mining, the increasing competition for mineral resources puts pressure on local communities.

Artisanal and small-scale gold mining is an important source of income among rural communities in Cambodia. It is also an increasingly important profession in Cambodia both for professional migrant miners and for local farmers who rely on mining as a supplemental source of income between cropping seasons.

Despite the abundance of international companies in Cambodia, a 2004 report suggests that gold miners do not work for international companies, but rather for small local companies. However, concessionaires, companies, and wealthy miners have slowly gained control over mining areas, leaving local independent miners and groups with little space to mine.

The high price of gold and the lack of employment opportunities are cited as main pull factors that draw people to engage in mining. ASGM generates employment in the rural areas and contributes to the local economy. However, it has been linked to mercury use and is seen as one of the primary sources of mercury pollution in Cambodia. A 2016 national report on mercury by the Ministry of Environment revealed that mercury use in ASGM is estimated to be around 34.5 g to 1,182 kg annually.

A number of studies have documented the effects of mercury use to the surrounding communities. In 2013, Murphy et al. released a report assessing the levels of mercury contamination among the miners and the fish in the Mekong River and concluded that artisanal gold mining is a major contributing factor to the area's mercury pollution. The study revealed that people located in the drainage basin with gold mines, on average, had more mercury in their hair (4.4 µg/g) compared with those living along the northern portion of the Mekong River (3.4 µg/g).^{xxviii}

At present, only a few initiatives in Cambodia are being implemented to respond to the growing issues on chemicals management and mercury use in gold mining. The need for a more concerted effort on eliminating mercury pollution in ASGM has been put forward by civil society groups, local communities, and the government. In the early parts of the decade, the Ministry of Environment conducted an assessment of mercury use in the country. Current government efforts include looking at ways to acquire funding support from international sources to assist in capacity-building initiatives for mine workers.

d) Legal Framework on ASGM

Artisanal small-scale gold mining in Cambodia is governed by the Law on Mineral Resource, Management and Exploitation (MIME) which was promulgated in 2001. The law allows 6 categories of mining licenses including artisanal, pits and quarries, gems, mineral gemstone cutting, mineral exploration, and industrial mining. Mining operations are deemed illegal unless a license is granted via the MIME.

The determination of Fees for Registration, Application (Fees of License), Extension, Right Transfer of Mineral License, Land Rental of Concession Zone for Exploration and/or Exploitation of Mineral Resources and Royalty of Mineral Resources is based on inter-ministerial Prakas No. 172 & 191 (MEF & MIME) of March 27, 2009. These all require a Cambodian citizen, legal entity, or concessionaire who holds a mineral resource license to pay fees to the state for the registration, application form (license fees), extension/delay, transfer of rights on mineral resources license, annual land rental of concession zone for exploration and/or exploitation of mineral resources, and the royalties of price of mineral resource.^{xxix}

Mineral License

1. A director/shareholder must complete a registration form in person at the Ministry of Commerce.
2. And then, he/she has to complete a registration in person at the MIME.
3. Application for Memorandum of Understanding (MOU) on Geological Survey must also be submitted to the MIME.

The Purpose of the MOU:

- The MOU is to determine minerals/ores for next detailed exploration and minimize costs and risks.
- MOU is valid for 6 months, and can be extended once for another 3 months.
- Technical reports shall be submitted to the Minister for review and approval before termination of MOU.
- If the technical reports are approved, he/she is required to sign a Mineral Agreement with the MIME to be responsible for conducting mineral operations.

Mineral Agreement Application Process:

- Exploration license is issued under the condition of the Mineral Agreement. Mining license can be applied any time during exploration period.
- Mining proposal shall be submitted to CDC through MIME for approval.
- If it is approved, he/she shall make and submit EIA report to MOE for approval.
- Mining license is issued; provided that his/her mining proposal and EIA report are approved accordingly.

e) Legal Framework on Chemicals Management

Cambodia signed the Minamata Convention in 2013 which provided greater momentum for the government to renew its effort in addressing its issues with mercury and to establish added guidance on the sound management of mercury. Although the country has yet to ratify the treaty, Cambodia's renewed commitment to establishing new "steps to facilitate the formalization or regulation of the artisanal and small scale gold mining sector" is consistent with the provisions set in Annex C of the treaty.^{xxx} At present, the management of mercury is not under the mandate of one specific government institution and it lacks specific measures that govern the general use of hazardous substances. Despite this limitation, there are legal frameworks such as the national constitution, royal decree or law, sub-decree, and prakas that aim to promote environmental protection, pollution prevention and control, as well as chemical and mercury related management and control.^{xxxi}

Constitution of Cambodia:

The provisions under Article 59 and 64 prioritizes health, and environmental protection and stipulates that any activity or chemical substance which could pollute the environment or affect human health will be forbidden and punished.

Law on Environmental Protection and Natural Resources Management:

The law aims to protect the environment from pollution by chemicals and other hazardous wastes through inventories and through the environmentally sound management of pollutants. This law highlights sustainable management of natural resources and its contribution to the socio-economic development of the country.

Sub-decree on Solid Waste Management was adopted by the National Assembly on 27 April 1999:

This sub-decree aims to regulate the solid waste management through technical means and safety measures in order to ensure the protection of human health and environment including biodiversity conservation. Although this law does not provide specific management guidelines for hazardous chemicals management focusing on mercury and mercury-added products, it provides a fundamental framework for the development of environmental regulation such as sub-decrees, ministerial declarations, circulations, codes and standards for environmental quality protection, mercury, and mercury substances' standard to environment in the Kingdom of Cambodia.

SECTION III: ASGM IN THE STUDY AREAS

a) Preah Vihear Area Profile

This section provides a brief background on the study areas, as well as a discussion on the artisanal small-scale gold mining communities in the area.

Geography



Map of Preah Vihear © 2008 https://sngsokann.files.wordpress.com/2008/08/lz_preah-vihear.png

The Preah Vihear province, which borders Thailand and Laos to the north, is one of the biggest provinces in the northern part of Cambodia. It's total land area covers 13,788 square kilometers, and the province consists of 7 districts, 49 communes, and 208 villages. Within the country, it borders the Stueng Treng Province to the east, Odar Meanchey to the west, Siem Reap and Kompong to the north.

With its acres of dense, hilly forests, and rich vegetation, the province is blessed with natural treasures. Many communities are located in extremely remote areas, and with no access to major roads, going around the province remains a challenge.^{xxxii} Preah Vihear has abundant water resources from the 219 natural water reservoirs and rich mining resources in the form of iron and gold ore.^{xxxiii}

Socio-economic Profile

Preah Vihear is one of the least populated provinces in the country, with only around 208,263 residents and a population density of only 15 people per square kilometer.

Preah Vihear is considered to be one of the poorest provinces in the country. In a recent Asian Development Bank study that utilized three targeting methods for identifying the poorest provinces in Cambodia,^{xxxiv} Preah Vihear was one of the seven provinces that appeared in all three results, signifying how poor the province is compared to the rest of the country.

The majority (85%) of the province's revenue comes from agriculture, with a small portion of the total revenue based on the income from medium-scale manufacturing businesses. With its rich iron ore deposits, the province has plans to develop its iron steel manufacturing industry. Currently, there are at least 24 companies applying for government-issued licenses to construct steel milling plants.^{xxxv}

Education statistics is also reflective of the economic situation in the province. 2014 data from the Ministry of Education suggest that students from Preah Vihear are dropping out of schools at high rates,^{xxxvi} with a dropout rate of 10.1% for the primary level, 18.4% for the lower secondary level, and a high 28.7% for the upper secondary level. When compared to the results of a 2011 study by the US-AID^{xxxvii} documenting the dropout trends for lower secondary level students, Preah Vihear's score worsened from the 2011 results of 12.5% to the more recent scores of 18.4%.

b) ASGM in Preah Vihear

ASGM activities in Preah Vihear are concentrated in the agricultural areas of Trapeang Tem Village, Rom Tum Commune, and Roveang District. For the purpose of this study, three communities from these areas were identified as focal study points, namely: Trapeang Tem Village, Phnom Dek, and Rumdeng Village.

Provincial Statistics	
# of Schools	360 Million (2016 est.)
Life Expectancy (Male)	40.5 (2008)
Life Expectancy (Female)	43.4 (2008)
Average Household Size	5.1
Identified % of poor households	32
Multidimensional Poverty Index	39



PHOTOS 1 & 2: Local miners digging and transporting soil on a tractor from the mining site, © 2016 Bora Keo

Like most artisanal mining sites, ASGM often occurs as a major poverty-driven activity particularly for the indigenous peoples in the area, coming second only to rice cultivation as the main source of income. In fact, it is estimated that around 80% of all gold miners in Cambodia may be classified as poor.^{xxxviii} In a 2011 study conducted by the Ministry of Environment,^{xxxix} daily income averages may vary depending on skill and access to equipment, with a low of \$1.5 to a high of \$15 per day. Another study conducted in 2012^{xl} noted that the difficulty of finding stable employment in Cambodia and nearby Thailand often led people to mining. In some parts of the province, the high demand for gold has been causing a rush for the precious metal, leading to more mine sites springing up in the area and more migrant mine workers moving to these sites.^{xii} Additionally, even children are forced to work at the mines due to poverty and because educational opportunities are dire. The same research group visited a remote commune in Preah Vihear, only to find that only two teachers served approximately 50 children from the 1st grade to the 4th grade.

Although small-scale mining has provided valuable employment opportunities for the people of Preah Vihear, small-scale mining remains hazardous because of the numerous risks involved. Moreover, the continuous use of chemicals such as mercury and cyanide has led to a number of negative environmental and health impacts. Preah Vihear's proximity to environmental resources such as the Prey Long forest has impacted its rivers – chemicals such as mercury and cyanide from the mine sites have had disastrous consequences for the environment and the communities living further downstream who are now exposed to mercury-laden food.^{xliii}

c) Gold-Extracting Techniques in ASGM in Preah Vihear's ASGM Communities

To further understand how mercury persists in mining communities despite the risks, it is imperative that its role in mining is understood. Focus group discussions, key interviews, and site visits were conducted to investigate how mercury is used and accessed by the mining communities. Additionally, relevant statistical data is acquired from local government units and non-government organizations whenever possible, although the current political climate in Cambodia limits the capacities of the researchers.

The field research conducted in resulted in the identification of three major gold-extraction methods^{xliii} with the use of mercury. All of the methods identified are used in varying degrees in Trapeang Tem village, Rumdeng Village, and Phnom Dek. For added insight on the amount of mercury consumed during these processes, results from a study on Mercury Trade conducted by the Alternative Information Development Centre are also presented.

1. Raeng Chhnang

The first technique is called *Raeng Chhnang* which translates to extracting gold using a big plate. The technique is considered to be less expensive and is thus more popular among artisanal gold miners working individually, including women mine workers. In *Raeng Chhnang*, the gold miners make use of a wooden pan filled with water, and then swish and shake it to separate the gold from the gangue materials. During visits to mine sites, miners claimed that no mercury is used during *Raeng Chhnang*. However, a local informant shared that miners still use a small amount of mercury with this method and smelt the amalgam at home with charcoal until it turns into a semi-refined gold. Although *Raeng Chhnang* is a popular gold extraction technique, the method still only recovers a small amount of gold per cycle. After selling the amalgam to gold buyers, the gold is then refined even further use borax and/or nitric acid.

Based on the Mercury Trade study conducted by AIDC in the Rom Tum Commune, miners use an estimated 38 grams of mercury or more depending on the amount of gold concentrate. This yields at least 0.375 grams of gold per cycle.

2. Raeng Sbai

Raeng Sbai is a mining method that uses a moderate amount of mercury, with miners utilizing basins to process the gold. In it, the gold miners first grind the ore and then sluice it with water through a piece of cheese cloth placed in the drain spout. At the bottom of the drain, they use a thin sheet of leather to catch gold concentrates. Although it uses more mercury than *Raeng Chhnang*, it is still popular with miners because it still generally consumes less mercury. At the final stage of processing, gold miners utilize a pan similar to the *Raeng Chhnang* method by panning the concentrate and using mercury to extract the gold. Likewise, the *Raeng Sbai* method still only recovers a small amount of gold depending on the quality of the ore. After extraction, the gold recovered will then be smelt and refined using borax by local gold smiths.

Based on the same study, miners use an estimated 50 – 100 grams of mercury per cycle. The amount of gold recovered depends heavily on ore quality, with fresh ores recovering at least 2 grams and tailings yielding less than a gram of gold.

3. Raeng Thas

Lastly, mine workers use a technique similar to *Raeng Chhnang* called *Raeng Thas*, but with stark differences in the use of mercury. In *Raeng Thas*, gold miners lace the launder plate (or a copper tray) with a small amount of mercury to catch the gold. Gold miners grind ore and sluice it with the launder using water. As more ore is grinded, mine workers inject more mercury to the plate as needed using a syringe or a plastic water dipper. Afterwards, the mercury amalgam is scraped from the copper tray and the gold is squeezed out with the use of a hammock cloth. Local mine workers attest that this method results in more gold produced than the previous methods, however, video footage from visits to the mine sites also reveal that this method utilizes the most mercury out of the three methods. Like the previous methods, gold amalgam is further refined by gold buyers with the use of borax.

In the Rom Tum Commune, miners use an estimated 200 grams of mercury to recover 1 Chi of gold (3.75 g), when processing ore with the *Raeng Thas* Technique.



PHOTO 4: Raeng Chhnang technique, © 2016 Bora Keo



PHOTO 5: Raeng Sbai method, © 2016 Bora Keo

Table 1: Mercury use and Local Gold Processing Techniques of ASGM Miners in Rumtum Commune, Preah Vihear¹

Local gold processing techniques	Chemicals use for processing	Average amount of gold recovered	
<i>Raeng Chhnang</i>	<p>Miners add mercury at least 38g of Hg or more if there is more gold concentrate</p> <p>Miners cook the amalgam into semi-refined gold with charcoal</p> <p>Gold smiths smelt and refines gold with borax</p>	At least 0.375 grams per cycle	<p>Artisanal miners working individually, usually women miners</p> <p>Miners sell the semi-refined gold to gold buyers;</p> <p>Miners cook the gold amalgam home</p>
<i>Raeng Sbai</i>	<p>Use mercury (at least 50g to 100g of Hg)</p> <p>Gold smiths smelt and refine gold with borax</p> <p>Gold smiths smelt and refines gold with borax</p>	<p>Depends on ore quality:</p> <p>fresh ores – at least 2 grams; tailings – gold recovered less than a gram</p>	Miners do the processing in a basin at the final stage; gold smiths in the village smelt and refine the gold (use borax to refine gold)
<i>Raeng Thas (copper tray with mercury)</i>	<p>Use mercury - at least 200g per cycle²</p> <p>Gold smiths smelt and refines gold with borax</p>	1 chi of gold (3.75g) per cycle	<p>Some miners use syringe to spread the mercury on the copper tray; others put any amount in a plastic water dipper; other miners use more mercury if they have more supply</p> <p>Gold amalgam is taken to gold buyer's shop for smelting; use borax to refine gold</p>

¹ Bora Keo's field notes, Preah Vihear, March 28-29, 2016; revalidated by researchers during series of FGDs conducted in 2017 and by a local informant

² Based on video footage of the process, Preah Vihear, March 28-29, 2016



PHOTOS 6, 7 & 8: Raeng Thas technique, © 2016 Bora Keo



d) Mercury Trade in Preah Vihear

The three study areas all acquire and utilize mercury through different channels, as discussed in the sections below.

1. Mercury Use and Trade in Trapeang Tem's ASGM Communities



Photos: © 2017 Eve Cubelo/BAN Toxics



Mercury containers and packaging - local miners use this to capture gold during sluicing with a copper tray, © 2016 Bora Keo

a. Area and ASGM Profile

In Trapeang Tem, villagers rely on small-scale gold mining as their main source of livelihood. Miners come from different backgrounds; most local miners are native to the area, but there are migrant miners brought by private companies to work, including foreign nationals like Vietnamese and Chinese miners. Almost all of the small mining concessions owned by local miners operate without a license from the government authorities. Since small-scale miners operate informally, the exact number of mine workers in the area cannot be determined.

There are three licensed mining companies operating in Trapeang Tem with these operations varying from small-scale to medium-scale gold mining concessions. Additionally, there are three gold mining sites in Trapeang Tem which are located in the villages of Prey Torteng, Prey Romdeng, and Pralay Khmoch. Most local miners prefer to start their exploration and excavation activities at Prey Romdeng, as the area is reputed to have the highest quality of gold available to would-be miners in the area.

Land rights remain a contentious mining issue. In Prey Torteng as an example, a two (2) hectare gold-mining site is believed to be secretly owned by either a tycoon operating under a different name or under the family of a government official. Local villagers are not allowed to mine in the area, with private security operations preventing people from entering mine sites. Despite the risks involved, local residents keep on mining mainly because of prior claims to the area long before the issues associated with the tycoon sprung up, and because of the belief that the state owns the land and the minerals.

b. Mining Practices

The local miners in Trapeang Tem do not process the gold at the extraction site. They dig and get the ore on site, place it in plastic bags, and with their carts and tractors, transport the bags of ore to their homes. Daily, local miners, on the average, transport bags at least 3 or 4 times from the extraction site to their respective homes in the village.

Ore processing is done in the village. Miners grind the ore into the desired grain size with the use of a specially designed ore grinding machine. At the time of the study, there were only 5 ore-grinding machines available for use in the village with corresponding fees. The rate charges depend on the amount of gold extracted. For example, the villagers pay 5,000 Riel (around \$1.25) for a bag of ore with minimal gold content. The fee goes up to around 10,000 Riel (\$2.50) for a bag of ore with more gold content.^{xliv}

In the Trapeang Tem village, the local miners use the aforementioned extraction techniques^{xlv} to extract gold from the ore. Based on local interviews, there are around 300 small facilities in 2 communes in the Roveang district. These facilities utilize any number of combinations of these techniques depending on their needs. Almost all facilities are unlicensed and operate without permit from the MIME.^{xlvi}

c. Mercury Use and Access to Mercury

As for the availability of mercury, the chemical is readily available in shops and local stores in the village. Likewise, mercury is also available at Phnom Pehn's biggest market.^{xlvii}

Mercury is well known among the locals as the chemical used to recover gold.^{xlviii} According to the locals, there are 2 kinds of mercury available to miners: red mercury and light silver-coloured mercury. Light-colored mercury is classified into three kinds: 1st kind is pure mercury which originates from the US, Russia, and Germany.³ Miners in the village, however, do not usually purchase this and opts instead for mercury made from China because it is much cheaper.^{xlix} In an interview with a Vietnamese family, they shared that mercury by the wholesale price can be imported directly from China to Vietnam via Phnom Penh. Additionally, there are a number shops at the O'Oressey Market that sell mercury.^l

2. Mercury Use and Trade in Phnom Dek's ASGM Communities^{li}

a. Area and ASGM Profile

Phnom Dek is inhabited by around 267 families with a total population of 1,250. Almost everyone is involved in mining. Mining activities involve men and women, including children. Children as young as 8 years old are forced to help their families mine because of the lack of economic opportunities available, making one of the worst forms of child labor a common occurrence in the area.

Most of the mining sites in this village were previously mined by landowners and mining companies. In terms of financing, miners use their own resources to mine and they also buy their own tools and equipment.

During the dry season, male miners find manual labor jobs to supplement their income while women continue mining. Most women miners in the village works in their respective small mine holes and are the ones extracting the ore. Bigger tunnels are mined by about 10-20 miners (men and women). Women collect around 10 small pails of ore in a day for panning.

The miners in Phnom Dek have mobilized other miners to formally form as a group and have applied for a community-managed mining area. As of this writing, the proposal has been approved at the district level, and the application has been forwarded to the provincial Department of Mining and Energy.

³ Based on data gathered from sellers and are uncorroborated at the time of the study

b. Mining Practices

In gold processing, women miners bring the ore to the nearest water source, about 5-6 meters from the hole. Instead of using sluice and launder pans, ore is directly panned near the water source. Each day, around 0.1 gram of gold is recovered and these women miners mine continuously until they have enough gold to sell.

Similar to the gold miners from Trapeang Tem, the gold concentrate is brought to the nearest gold buyer in Phnom Dek for smelting. In Phnom Dek, not all gold buyers use mercury in smelting. They use a steel bowl, heat it up using a lighter to melt the gold, and blow the dust out from the gold. ASGM miners pay about \$1 for smelting if they do not sell the gold to the gold buyer.

Artisanal miners pan for about 5 days to be able to get enough gold for selling. The gold they collect for a week of panning usually sell for around \$2.50 to \$5.00, with quality of the gold being about 20 karats based on color of gold jewelry available. Additionally, these women mine workers in the area do not usually have access to equipment like weighing scales, making it difficult to assess the amount of gold they recover on the regular.

After mining is finished or when mine workers feel that all the gold in the area is extracted, mining pits are usually left open, leading to numerous accidents that often involve domesticated animals falling into the mine holes. These incidents often go unnoticed and have resulted in a number of injuries and deaths.

Recently, miners have observed the decreasing chances of finding gold through surface mining. The income from surface mining is around 8 hun to 1 Chi (3.75 grams) per day with the use of a mechanical process, and about 2 Hun or 5 Li (less than a gram) with the traditional method.

As is the case with mine workers from other sites in Cambodia, gold earnings are barely enough to pay for the workers' labor and gasoline. Moreover, gold is mined with inadequate knowledge on proper techniques, and access to equipment is minimal, if not, non-existent at all.

Income from gold mining is barely enough for survival, which explains why most miners and their families supplement this with rice farming in some parts of the year. On the other hand, gold mining provides them with quick cash for their basic needs on a daily basis—for food, transportation and other miscellaneous expenses.

One of the main concern is the lack of capital to procure efficient technology for gold mining. Some of them acquire this through partnership with outsiders or other groups. Miners and landowners invite international companies for a joint exploration venture. But this can be risky and provides no guarantee for a return on investment. A lot of this partnership ventures have failed in the past. However, this type of opportunity generates temporary jobs for many people in the village. Some mining companies pay the workers well – a mine worker can sometimes get around one million riel (\$250) monthly when profit is good. But normally, a worker gets paid for about 20,000 riel per day or about \$150 per month. Companies operating under questionable intents, however, remain. There are companies hiring private securities to keep the local miners from digging for gold in their area.

Unique to the study area in Phnom Dek is the miners' sharing schemes. Individual miners who work on their own or in groups pay rent to the land owners for 20,000 riels (\$5) a day. However, this system does not guarantee sure profit on the part of the miners. Income still depends heavily on how much gold can be found in the area. There are a number of reported times when miners lose their investments or the produce barely goes over the profit margin.

Another sharing scheme exists between miners and landowners where about 30% of the gold recovered goes to the landowner. This arrangement works very well when a mutual trust between landowner and the miner exists. Still, landowners may feel that miners are not transparent about the actual amount of gold recovered from the operation.

c. Mercury Use and Access to Mercury

In Phnom Dek, the local miners claim that mercury is not used in gold recovery. Instead, traditional methods and techniques are used. According to these locals, mercury emissions and releases come from larger mining companies who regularly use mercury in extracting gold. Moreover, these mining companies do not have waste water facilities so their tailings and waste water are dumped into the canals.

There are 2 gold buyers in Phnom Dek. They make gold jewelries and trade within the province and outside -- to Kampong Thom and Phnom Penh.

Gold refining is not done by the local miners because they lack skills and equipment to smelt the gold. After concentrating, the gold is semi refined and is brought to the goldsmith for final smelting. Most of the time, the goldsmith buys the gold from the miners.

The buying price for 1 Chi (3.75 grams) of unrefined gold is around 480,000 riel (\$120). The gold is sold to the local goldsmith and the goldsmith refines the gold -- fetching a better price of up to 550,000-560,000 riels (\$140) per Chi.

3. Mercury Use and Trade in Rumdeng Village's ASGM Communities^t

A. Area and ASGM Profile

In the Rumdeng Village, local miners work in mines to supplement their annual income. In fact, income from gold mining is often used to fund farming activities, labor, and farm inputs such as chemical fertilizers and seeds. Miners believe that income from mining helps support their basic annual needs. As such, mining has come to signify hope and the promise of wealth – in the rare instance that high-grade ores are found, mining can lead people out poverty and afford them several luxuries in life including a new car, a new house, and modernized mining equipment.

For local villagers, mining provides a legitimate alternative to other subsistence activities such as logging, partly due to the fact that gold as a commodity can be sold to a wider range of interested buyers.

In the last few years, more and more people from other parts of the country have moved to the area to mine, resulting in a steady increase in the population. Moreover, the increase in the population due to mining can be traced back to the influx of migrant miners who were recruited to work by mining companies from as early as the 90s.

B. Mining Practices

Historically, Rumdeng Village's mining community is inhabited by two groups. The first group is made up of migrant miners who were hired by the mining company to work in their concession areas in Rumdeng and Phnomlung villages and families who moved to the area to escape the war between Khmer Rouge and the Government.

The aforementioned company was only given a license for exploration, e.g., the company was allowed only to explore possible gold-laden areas, but not to extract these gold. Despite this, the company went on to mine the discovered gold. This was met with discontent from the local people, and many landowners protested. The legal proceedings lasted for a decade before the land was returned to the villagers.

The other groups of miners are called investors – people who moved to the area to find local business partners for a mining concession. These people provide added capital to the land owners for joint venture. Some of these people are high ranking officials, policemen, army officials and local authority officials.

During peak mining season, the population can go up to 120 households. However, the population fluctuates down to less than 90 households when gold is scarce or during the dry seasons when the water from the streams and wells dry out and there is not enough water to process the ores.

C. Mercury Use and Access to Mercury

Local miners from the Rumdeng Village have been using mercury for around a decade, learning how to use it from the miners working in nearby mining companies. Although miners are generally open about their use of mercury, there is growing concern about the effects of the mine tailings and mercury wastes being dumped into their rivers. The waste tailings flow to streams on the mountainside and go downstream where the villager's settlements are located.

At present, a number of Chinese and Vietnamese mining companies have been granted mining concessions around Phnom Lung Mountain, Phnom Bak, and Phnom Dop. The company wastes tailings flows from Phnom Dop and Phnom Lung areas to the Anlung Sralao canal. Even the waste tailings from Phnom Bak through Pralay Roeuesey go to the Anlung Sralao canal which then flows to O'Talork and StengSen river. The wastes from these canals all end up in the Tonle Sap.

Local villagers also believe that gold can still be produced from the recovered amalgam in the tailings. This has led to a practice where miners gather tailings discarded from around the concession areas for mining companies in the hopes of acquiring more gold.

4. Summary of Findings

Generally, the study reveals that most of the mercury-processing in mining happens within the villages, where location can play a big factor in determining the extent of the negative impacts. The amount of mercury used varies depending on the amount and kind of ore, as discussed in the section on extraction methods. Although the miners from Phnom Dek claim that mercury isn't used by small-scale miners, the lack of available statistical data prevents the research team from fully confirming this claim. As it is, mercury use poses significant risks to miners, including women and child laborers.⁴ Additionally, local miners themselves are aware of the dangers of mercury use as environmental and health effects have become more apparent through the years.

As reported during the key interviews and the focus group discussions, large mining companies use mercury, and are significant sources of mercury emissions and releases. This is concerning, not only because it aggravates the health and environmental concerns, but also because these mining companies are legal. The fact that mercury is used by legal mining operations may point to bigger issues in terms of monitoring and regulation.

As for the accessibility of mercury, the local respondents from Trapeang Tem provided the most comprehensive answers on mercury accessibility, including the different kinds of mercury available in the markets. The key highlight of the discussion with regards to the availability of mercury is the fact that the chemical is readily available in stores in Cambodia's capital of Phnom Penh. This means that mercury itself can be accessed at will by miners. Moreover, the respondents from Trapeang Tem have confirmed that local shops within the village also sell mercury, making the chemical even more accessible to would-be buyers. Although this has not been confirmed, it is entirely possible that local sellers of mercury may exist in other mining communities as well.

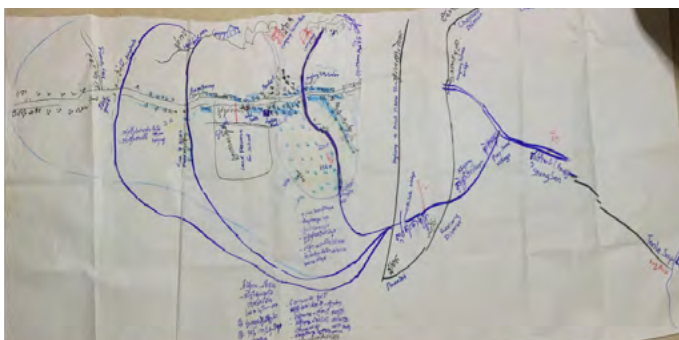
Lastly, the respondents have confirmed that the mercury available in their areas all come through illegal means from different countries, including the United States of America, Russia, Germany, and China. However, the sources were not verified, as these claims are based solely on the accounts of the sellers. In terms of miner preference, mercury from China is considered to be the choice of many because of its relative affordability when compared to mercury produced in other countries.



Local miners' mine holes , © 2016 Bora Keo



Mining facilities release wastewater into the canals



During FGD, miners' illustrate how wastewater from mining facilities travels far and ends up in Tonle Sap Lake (rightmost side)

⁴ The issue of child labor will be discussed at length in the following section.

SECTION IV: WOMEN AND CHILDREN IN ASGM

A. Introduction

The roles of women and children in ASGM are vital issues that need to be addressed. Child labor remains a global issue because it deprives children of the rights to health, education, and a proper childhood, among others. Likewise, women face inherent discrimination that deprives them of valuable opportunities simply because of their gender. Based on the result of our focus groups in the mining communities in the province of Preah Vihear, women engage in mining activities out of poverty and lack of other livelihood opportunities. However, their contribution to the family income is seen as an additional income to supplement the seemingly inadequate salaries of their husbands. The prevailing conditions and circumstances, generally do not provide opportunities for self and economic development. In addition, the lack of enabling options and safe working conditions violates women's welfare and rights.

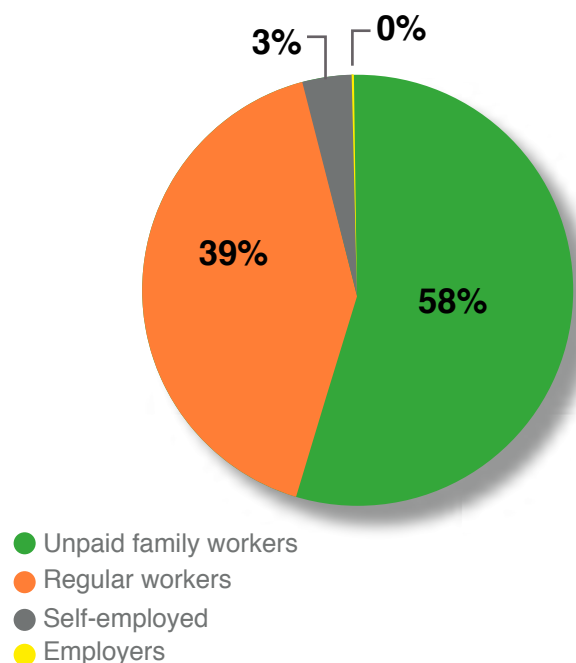
In Cambodia, significant efforts have been made to address the issues of child labor.^{liii} The Ministry of Labor and Vocational Training has recently adopted regulation policies that aim to prevent children from engaging in hazardous jobs. A number of other policies, like the National Plan of Action on the Suppression of Human Trafficking, Smuggling, Labor, and Sexual Exploitation are designed to protect children.

Despite these efforts, child labor remains to be a problem for Cambodia. The lack of a compulsory education requirement means that children are not legally obliged to be in school, leaving them unprotected from the lures of working too early. Often, factories and workplaces where children are employed in exert efforts to hide their child workers from the authorities. Moreover, children themselves lie about their age, and in most cases, acquire fake identification cards to get jobs. Parents, on the other hand, are left with few choices because of poverty.^{liv}

A study by the International Labour Organization revealed that 2 out of 10 children are engaged in economic activity. Of these, 56.9 per cent can be classified as child laborers, e.g., children whose work engagements deprived them of their childhood.^{lvi} Among them, 31.3% engaged in hazardous labor.

Women, on the other hand, represent 51% of Cambodia's population.^{lvii} Despite this, women are constantly underrepresented politically, as men continue to dominate the public spheres and command higher government

Employment Status of Child Laborers in Cambodia



positions. With the Cambodian culture being dominantly patriarchal in nature, women often suffer from a lack of gainful employment and economic opportunities outside of their homes. The prevailing patriarchal perceptions of women as the subservient gender perpetuates the cycle of poverty and marginalization.

Patriarchy in Cambodia traces its roots back to generational adherence to Buddhism and Chhap Srey, the traditional code of conduct for women, where women's chastity and femininity are defined from a patriarchal point of view. In more modern times, the code of conduct has translated into a cultural belief that girls should not strive for higher education but instead should focus on adhering to traditional gender roles of performing household chores, working hard for their husbands, and protecting their virginity.^{lviii}

In 1992, the Convention for the Elimination of All Forms of Discrimination Against Women (CEDAW) was ratified. However, recognition of the CEDAW did not guarantee full protection for Cambodian women – while there has been a collaborative effort by various NGOs and human rights groups to educate, and raise awareness amongst women of their rights, many women remain unaware and vulnerable. This is a particular problem in the countryside where levels of literacy and education are low.^{lix}

Percentage of Women in Various Sectors

Non-agricultural sector	75%
Civil service	32.2%
Private sector	40%
Factory work (primarily in the textile industry)	87%

Article 36 of the Constitution and Articles 172 to 188 pertaining to Cambodian labor laws stipulate that women have equality in all spheres of employment. However, even the government admits that these laws are weakly monitored. This acknowledgement is alarming since women have been an integral part of the country's labor force. Early data from as far back as 2003 prove this, with 73.5% of women being depicted as participants in the national labor force. These statistics obscure the fact that many women are also employed in the informal sector in small scale trading, as waitresses and as domestic helpers where even rudimentary employment rights are practically unenforceable.^k

B. Women in ASGM^{lx}

To understand the situation of women in ASGM communities in Preah Vihear, a Focus Group Discussion was conducted in Rumdeng Village with participants from Rumdeng and Phnom Sampong. The FGD questions focused on identifying the roles of women in ASGM. Their perceptions on their roles as women in mining also provided valuable insights on how they perceived their issues and the needs of the communities. Participants were asked to identify the different mining-related activities that they engaged in, as well as the key issues facing them.

Summary of FGD Results

The discussions revealed that women engage in mining in a variety of ways. For a lot of cases, women can be seen panning beside rivers surrounded by excavated ore. At times, they can be seen rummaging through the land just outside of the mining companies in the hopes of recovering gold from the discarded tailings. Often, their children can be seen playing around the area and can even be seen helping with digging and hauling. Most women also engage in heavy manual labor. They dig their own mining pits manually, and carry the ore for panning and processing.

The respondents noted that a typical work week consists of working alone for seven days. The FGDs also revealed that the main motivation for engaging in mining work is to supplement the incomes of their husbands, as their husbands' incomes alone cannot support the whole family. However, because the income from mining depends heavily on the quality and quantity of extracted ore, working at the mines still does not guarantee that they can cover the family's expenditures. This often is a major factor that leads children to helping their families at the mines.

During times when mining is not possible, i.e., during rainy seasons, women also try and supplement their family's incomes by engaging in other jobs. A lot of women work in the local stores or try to grow rice for added income. In some cases, women also work for mining companies as cooks, providing food to mine workers.

Essentially, women engage in mining activities out of poverty and lack of other livelihood opportunities. Income from mining is seen as an additional income to supplement the seemingly inadequate salaries of their husbands. The situation further aggravates the issues of women, as they are deprived of opportunities for self and economic development. The lack of enabling options and safe working conditions violates women's welfare and rights.

As part of the FGDs, the participants were also able to identify gender-based instances of violence that they have experienced in mining communities. Understanding the inherent risks that women face is vital to understanding just how discriminated they are in these communities. One case of sexual abuse in the mining area were reported in the FGDs. Additionally, some women have shared their experiences of domestic abuse in their own homes.

Lastly, the participants were asked to list down the issues facing their own communities. Identifying these issues can help empower women, and make them active players in helping create progressive and healthy societies.

Key Community issues identified	
Health care facilities	There are no immediate health care and birthing facilities within the communities
Educational facilities	There are limited educational facilities in their communities. The respondents have also reported that the distance between their communities and secondary/tertiary schools remains a major factor in decisions regarding the education of their children.
Transport facilities	Road conditions and the high transportation costs prevents most villagers from accessing needed facilities such as the aforementioned health care and educational facilities



Focus group discussion with male miners in Phnom Dek, © 2016 Evelyn Cubelo / BAN Toxics



Women miners believe that presence of black stone means abundance of gold in the area © 2016 Evelyn Cubelo / BAN Toxics



Miners using hydraulic pump – soil sediments going straight to the launder © 2016 Evelyn Cubelo / BAN Toxics



Genderbased violence mapping © 2016 Evelyn Cubelo / BAN Toxics

C. Children in ASGM^{lxii}

To understand the situation of children in ASGM communities in Preah Vihear, a Focus Group Discussion was conducted involving 12 participants aged between 11-14 years old and enrolled in the 4th and 5th grades.

The participants all hail from Rumdeng Village, where only one primary school operates. With a total of 3 teachers and 3 classrooms, 99 students participate in classes held from 7:30am to 11am.

The Situation of Children



Weaving women's stories through community mapping, Rumdeng village (left) and Phnom Sampong

Photos: © 2016 BAN Toxics

Summary of FGD Results

For the FGDs, the participants were asked to describe and enumerate the places where they mostly converge and spend their time in. The table below outlines these spaces as how they are used as described by the participants.

Space	Activity
School	Space for learning and playing
Houses	Space for helping their parents with house chores and playing
Stores	Space for playing with other children
Mountainside	Space for helping in mines
Mine Tunnels	Space for helping in mines
Gold Buyers' Shops	Space for playing



Smileys represent children's presence in various places in the community, © 2016 Jimbea Lucino/BAN Toxics

Based on the FGDs, a number of spaces were identified as potential hotspots for child labor. The participants noted that as early as age 12, children accompany their parents to the mountains and to the mine holes surrounding the communities to help with digging and carrying the ore for processing after classes and/or during the weekends. Additionally, girls work extra jobs helping cook food for mine workers. Aside from the impacts of undertaking heavy manual labor at an early age, child laborers also face numerous environmental risks – due to the dry season, forest fires often occur at the mountains where children regularly help with mining work.

Although children do not work directly at gold buyers' shops, the research identifies these areas as potential hotspots. Because children often use nearby spaces as play areas, the risk of indirectly being affected by the toxic mercury fumes from the nearby smelting areas is increased.

Another key issue identified during the FGDs is the fact that as most miners live almost-nomadic lifestyles (e.g., they migrate to places where gold is purportedly available), most children suffer. During dry seasons when gold is especially hard to find, these migrants often return to their hometowns, forcing children to drop out from school. Data from the lone primary school in Rumdeng Village suggest that about 20-30% of the migrant miners' children drop out during the dry seasons.



A visual representation of Children's spaces in the community, Rumdeng Village, © 2016 BAN Toxics

D. Conclusions

Based on the findings from the FGDs conducted with women and children, there is qualitative data to indicate that they experience even greater levels of marginalization because of the inherent discrimination against women in mining. In addition, women and children also face unique physical and health risks when involved in mining and the use of mercury. This mainly springs from the informality of the ASGM sector in Cambodia and the lack of opportunities and support for women and children in these situations. Most often women work in hazardous conditions in the mining areas and despite of their hard work, income remains irregular and by chance. Derived income mainly goes to family needs. The communities they live in are isolated and health and social protection services are weak.

A shift towards safer and more humane mining conditions then, will not only benefit workers directly working in mines, but also women and children who utilize the spaces in mining communities.

SECTION V: INTRODUCTION TO MERCURY-FREE METHODS^{lxiii}

In an effort to help reduce mercury use in artisanal mining sites in Preah Vihear, BAN Toxics helped introduce new mining methods and technologies to small-scale miners working in the study areas. To identify the training needs of the small-scale miners in the area, rapid assessment studies were conducted

A. Gravity Concentration Method

Central to BAN Toxics' program with mining communities is the introduction of basic Gravity Concentration Method. Gravity concentration refers to the separation of minerals based on specific gravity. The process is designed to recover very high grades of ore into very small masses.^{lxiv}

Gravity concentration is a simple recovery method that has little environmental impact. Mercury-free techniques, such as gravity concentration, provide safer alternatives for miners, their families, and local communities.^{lxv} Moreover, gold recovered through these safer alternatives may also help miners market their gold at higher prices.

BAN Toxics' promotes the use of mercury-free methodologies, including the gravity concentration method. Basic or simple gravity concentration also means that resources needed to perform the operation are readily available in mining communities. Gravity concentration takes several forms, from the basic or simple methods which include panning and sluicing, to the more advanced methods that utilize shaking tables, spiral concentrators, vortex concentrators, and centrifuges, among others. Common among these methods is the use of water to separate the lighter materials from the gold.



Local miners working in groups, © 2016 Bora Keo

B. Miner to Miner Training

To introduce the basic technology, BAN Toxics' fielded its Technical Miner Trainer (TMT) from the Philippines. A small-scale miner with around 40 years of experience working in mines, Rizalde Perez has the wisdom and experience to share basic technologies as well as to relate with small-scale miners on a more personal level. These are key characteristics needed to ensure that the transfer of technology becomes successful.

As part of the miner to miner training sessions, the technical miner trainer provided brief demonstrations of a number of useful techniques to ensure that miners recover as much gold as possible. Basic techniques on performing manual assays were showcased by the trainer, sampling 2-3 different types of rocks during the demonstration. Additionally, the trainer also held knowledge-sharing sessions designed to increase miner knowledge in identifying gold vein formations and various other types of gold-bearing ores. These sessions were held to increase the miners' capacities in recovering more gold and to help prevent further destruction of mine sites.

For the demonstration of the basic gravity concentration method, the Technical Miner Trainer constructed a sluice box and a launder pan. Key to the discussions is the demonstration of how efficient the gravity concentration method is. Local miners from the Rumdeng Village confirm that, on average, they can only recover as much as 3g of gold for every ton of ore. The trainer, on the other hand, asserts that as much as 8g of gold may be recovered through the use of the more efficient gravity concentration method. The actual demonstration provided encouraging results – an extra 1g of gold was recovered for every sack of ore using mercury-free processes.



Technical Miner Trainer, Nono Perez – sampling ores and showing the participants how to do a quick manual assay, © 2016 Bora Keo



Types of ores found in the mining sites in Rumtum Commune, Preah Vihear, Photo © 2016 Bora Keo



C. Training Results & Concerns

The Miner-to-Miner trainings provided valuable capacity-building opportunities for the small-scale miners in Preah Vihear. Aside from the gravity concentration methods introduced by the Technical Miner Trainer, the local miners gained valuable knowledge in terms of identifying potential gold hotspots through manual and laboratory assays.

A number of local miners have also started to plan for the move to mercury-free facilities. Miners from Phnom Sampong and Phnom Dek who participated during the demonstration of the gravity concentration method have already discussed the possibility of constructing sluice boxes and launders in their own homes. However, because gravity concentration methods use more water – a scarce resource in the area – the primary concern is where water can be sourced from. As advised by the TMT, the construction of a pond or a water tank may be helpful in providing water for the miners especially during the dry season.

Lastly, the miners have also identified capacity-building needs and equipment needs as main causes for concern. Local miners have voiced their concern about their need to improve their panning skills. Panning, a skill heavily needed to ensure success with gravity concentration methods, extracts gold from placer deposits using a pan and water until gold is separated from the ore.

Based on the initial findings and the concerns of the miners, continuous capacity-building initiatives (particularly on the use of the various methods introduced), as well as support for the acquisition of the needed equipment are needed to transition fully to mercury-free methods.

SECTION VI: STAKEHOLDER CONSULTATIONS AND PRESENTATION OF RESULTS ^{lxvi}

At the conclusion of the main activities, a stakeholder consultation was organized by BAN Toxics and the AIDC to present the main findings of the study. The consultation's main purpose was to identify possible strategies to address the issues and concerns that the ASGM communities face, as identified in the study. The participants of the consultation workshop included commune leaders, representatives from the Ministry of Environment, and representatives from relevant civil society groups.

Key highlights from the activity include the commitment of the participants to organize a coordinated action to contribute to the reduction and the elimination of mercury use in the province. The participants also agreed that there is a need to define a much stronger plan of action and collaboration among the government agencies and civil society organizations to effectively identify immediate and long-term solutions.



Local Community Stakeholders Consultation, Siem Reap, November, 2016, © 2016 Bora Keo

Proposed Actions ^{lxvii}

The stakeholder groups who participated in the workshop were asked to present their strategies for the reduction of mercury and the improvement of the capacities of the communities involved. Outlined in this section are the proposed actions from the Provincial Government Agencies (Ministry of Environment & Ministry of Agriculture) as well as the proposals from the Civil Society Groups (CEDAC, NTFP, AIDC, DPA, World Vision).



Local Community Stakeholders Consultation, Siem Reap, November, 2016, © 2016 Bora Keo

PROPOSALS FROM THE PROVINCIAL GOVERNMENT AGENCIES

Activities	How	Who
Reduce and eliminate the use of mercury	Integrate with the existing action plan Work with the government institution to conduct community awareness raising	Gov't officers, local authority, and the community
Policy and Regulation or Order	Provide support to the relevant institution for the creation/enforcement of laws, regulation, orders governing mercury use	Gov't officers, local authority, and the community
Capacity building to institution and community	Conduct trainings, workshops, study tour in the country and abroad to enhance capacity of staff, gov't officers, and community	Gov't officers, local authority, and the community
Promotion the safe keeping and mobilize the mercury	Awareness raising to the community and relevant institution	Gov't officers, local authority, and the community
Safe place to store mercury in the province	Identify and suggest a place suitable for safe storage of Hg to the relevant government agency	Gov't officers, local authority, and the community

For each of the provincial government's proposed activities, the resource needs identified are individual budget plans as well as materials for the planned training and workshop sessions. Additionally, the provincial government has targeted to implement all of the proposed activities within 2017. As stipulated in the proposals, full coordination and cooperation among the government officials, the local authorities, and the communities involved is needed to ensure the success of the proposals.

For the proposals from the civil society groups, the main implementers will be the officers and the staff from the NGOs involved. As identified during the workshop, the main resource and support needs will be addressed by the support fund from the NGOs involved.

PROPOSALS FROM CIVIL SOCIETY GROUPS

Activities	How	Target
Reduce and eliminate mercury	Educate the community on mercury toxicity and and impacts to health and environment	2017
Lobby for the draft a policy regulation or order	Educate and promote relevant laws and other order or policy governing ASGM Help implement the law after the community understand well the impact of mercury and lobby for a legal penalty	2017 and onward

SECTION VII: SUMMARY AND CONCLUSIONS

This section discusses the conclusions and recommendations from the research team. Also highlighted in the section are the key learnings gained from the duration of the project's implementation.

A. Issues and Challenges

- Poverty and the lack of other options in many rural areas push people to engage in mining, as privileges typically reserved for richer communities, such as academic qualifications, are not prerequisites to engaging in the industry. .
- Land rights continues to be an issue for ASGM. Foreign companies and private investors own more than 50% of the land open for mining, making artisanal mining increasingly difficult to formalize and operate in a legal space. The disputes in land ownership have driven miners out of their lands, and have affected their livelihoods significantly, pushing them further to informality
- There is a growing concern about the environmental and public health impacts of mining. Local miners and mining companies alike are dumping their mine tailings and wastes directly to canals and into streams, rivers, and lakes. The issue is aggravated by the fact that there are no existing options for safe disposals of waste, and local miners do not have adequate knowledge, skills, and resources to adapt mercury-free alternatives. The lack of awareness on the effects of mercury as well as proper storage and disposal practices are also endangering the health of non-miners who reside in mining communities including children and women who are most vulnerable to its impacts.
- As reported by the respondents, large mining companies are also significant sources of mercury wastes and emissions. This is potentially a major issue, as mining companies operate legally, and thus, should be subjected to proper monitoring and regulation from the authorities. Their continued use of illegal substances such as mercury may be reflective of the current state of chemicals management in the country. Although the study was not able to explore this issue in detail because of resource constraints, it is recommended that future studies be conducted to verify these claims.
- The absence of a legal framework that directly enforces laws and policies on chemicals management in ASGM is also a growing concern, as the lack of concrete policies to manage the use of mercury has perpetuated its role in ASGM. This is also a major contributing factor to the lack of community capacities to enforce policies on chemicals management as well as monitor its use in ASGM.
- The lack of educational facilities in the mining communities means that there are limited opportunities to escape poverty. Primary schools could not accommodate all children in the village because of the inadequate number of teachers, classroom materials, equipment and even school chairs. With the lack of opportunities, people are left with no choice but to engage in poverty-driven activities such as mining.
- Finally, the issues of gender and child labor still linger in mining communities. These mining communities themselves are marginalized, but the issues of inherent gender discrimination (as evidenced by multiple reported cases of workplace discrimination, sexual and domestic abuse) as well as the cases of child labor further places women and children at a disadvantage. These issues must be properly addressed by the authorities to ensure that women are given equitable opportunities and that children are protected from the worst forms of child labor.

B. Insights and Lessons Learned

ASGM's Contributions to Livelihood and the Local Economy

- The ASGM sector in Cambodia is mostly poverty driven. Local communities and migrant miners turn to mining because of the lack of other viable sources of income.
- ASGM activities contribute to local economy. Income from mining enables families to supplement their basic needs on a daily basis. It is also a quick and easy source of capital for their agricultural activities and other small businesses. Mining activities also create and help other local businesses thrive like stores, food vending, and public transportation services.

- Women and children can be seen working in the mines. Although highly illegal, cultural practices mean that mining families believe that mining allows their children to make substantial economic contributions to their families. Thus, children can be seen accompanying their parents in the mining areas by the river or by the mountainside performing manual jobs such as carrying a sack of ore, digging and sorting out ore concentrates on the sluice.

Women in ASGM

- Women miners perform multiple roles. Aside from managing their homes, women also work in the mines and their farms to help supplement the income of the family. Their contribution to the secondary economy in the community needs to be quantified and acknowledged.
- Because of the multiple unpaid roles that women perform in the household and their families, engaging in mining tends to further deprive women of the opportunities for economic relief and development. The need to recognize the rights of women and their contributions should be translated to more enabling options and safe working conditions should be given high importance.
- Inherent discrimination still exists within the mining communities. Despite the prevalence of women performing heavy manual labor in mining communities, women miners are still not fully accepted and are not treated equally. For local mining companies, women are seen only as performers of menial tasks such as cooking for male miners.

Mercury Use in Mining

- Mercury use is prevalent. Miners use mercury without adequate personal protective equipment. Mercury is handled with bare hands and is stored randomly in places where children play and converge. More disturbingly, mercury use occurs often in households where family members are exposed to its risks.
- The smelting of gold is performed around public spaces like schools, and potentially endangers a large portion of the communities.

Government Support

- ASGM activities are not formalized and most operations are not registered. The lengthy application process, technical procedures and requirements and costs discourage miners from pursuing formal applications.
- The roles of the Ministry of Mines as well as the Ministry of Environment in regulating ASGM and monitoring the use of chemicals such as mercury are not clearly defined.
- There is a need for adequate training and capacity-building support from the local governments. Local miners lack the technical knowledge on proper exploration and extraction methods. Most of the existing methods used are derived from the operations of big mining companies, and do not guarantee efficiency and safety for artisanal miners.

C. Recommendations

When Cambodia ratifies the Minamata Convention and addresses its existing mercury and ASGM issues, the need for effective multi-level development approaches will be stronger than ever. A community-based approach is recommended to draw support from the target communities and for the government to implement effective solutions that are supported by sound development and policy perspectives.

Based on BAN Toxics' preliminary assessments and consultations with the mining communities in Preah Vihear, four key recommendation categories were identified. These include policy interventions, research and knowledge needs, organizational development and gender prioritization needs, and awareness-raising needs.

Policy Interventions

Policy interventions designed to promote the effective management of chemicals, including mercury, as well as to promote safer and more humane working conditions are recommended. The creation of an enabling environment that paves the way for the formalization of miners can help eliminate the inherent dangers of mining as well as the existence of illegal practices such as mercury use and child labor. Additionally, the proper identification of work streams and roles and responsibilities for the relevant agencies including the Ministry of Mining and the Ministry of Environment need to be prioritized and clarified.

As such, specific recommendations may include:

1. Prioritizing the ratification of the Minamata Convention
2. Prioritizing the integration of sound chemicals management in the programs of the local government and NGOs working in the area;
3. Reviewing current policies on hazardous waste management and disposal;
4. Implementing transition measures like simple mercury free mining techniques to prevent the further release of mercury waste tailings into the canals and streams;
5. Reviewing ASGM-related laws and identifying gaps and obstacles to formalization in an effort to pave the way for an enabling environment for the Cambodian ASGM sector;
6. Addressing land rights issues and creating avenues of dialogue with mining companies and ASGM communities to carve out a space where ASGM can operate in.

Research and knowledge needs

As the current efforts of Cambodia on chemicals management and artisanal mining communities is limited, a number of baseline information must be identified. Baseline data and related research efforts will greatly enhance alignment of future interventions with the needs of the environment and the communities involved.

As such, specific immediate actions may include:

1. Prioritizing building the capacities of local environmental officers on mercury inventory, monitoring, disposal and storage;
2. Conducting environmental monitoring activities to gauge level of mercury contamination in the air, water, and soil;
3. Organizing more technical miner-to-miner trainings in the ASGM communities and build local miner capacities on mercury free methods of recovering gold;
4. Capacitating local communities to observe practices and document these;
5. Conducting more in-depth studies on the labor and working conditions of the people in ASGM communities to help formulate projects and programs that are consistent with the conditions on the ground.

Gender, Child Labor, and Organizational Development

Highlighted in the study is the fact that inherent gender discrimination exists within mining communities. Mining communities themselves are marginalized economically, and women face even greater levels of discrimination solely because of their gender differences. Because of this, measures to ensure that women are given equitable opportunities are recommended. This may be achieved through concentrated efforts to promote gender perspectives and by strengthening organizations.

Additionally, the working conditions that miners face on a daily basis are filled with a number of risks that endanger their health and rob them of other valuable resources such as time and decent pay. Directly related to the working practices in small-scale mining is the immense environmental impacts of the use of toxic chemicals such as mercury. It is then imperative that the formalization of ASGM operations in Cambodia be prioritized to ensure that proper institutional mechanisms are in place to pursue improved working conditions and to lessen the harmful environmental impacts of small-scale mining.

As such, specific recommendations may include:

- Promoting and integrating gender perspectives in the programs of the local government and NGOs;
- Supporting the formalization efforts of the government for the development of ASGM. For this to be successful, a thorough review of the land issues is needed as well as the continued support for the formation of miner associations and related community organizations are needed. Moreover, the formalization procedures such as the application process and the licensing procedures need to be reviewed to ensure that they can be accessed and performed by artisanal mine workers.
- Providing added organizational development to community miners' associations especially women's associations;
- Reviewing child labor cases in the ASGM and build capacities of local communities to monitor and report cases of child labor in these areas.

On the incident of gender-based violence shared by one women miner participant in Rumdeng Village, the researchers presented the incident to the NGO partners and local government authorities in Preah Vihear during CSO Consultation in February 2017. Although, Cambodia's law and guideline on Violence Against Women already exist since 2005, a deeper analysis of the gender dynamics in the ASGM sector has yet to be done. The need to proactively integrate gender and development issues in the community and in ASGM area in particular were generally acknowledged and deemed significant in pushing for the development and recognition of the sector. BAN Toxics outlines general recommendations in effectively handling cases of gender based violence in the mining community:

- a) For CSOs, conduct a gender analysis study and organize consultations on gender and development in ASGM communities in Cambodia;
- b) Support ASGM communities and CSO partners to lobby for a review of the gender and development program of the Cambodian government including cultural practices in handling GBV cases;
- c) Support CSOs call for a gender and development program mainstreaming in Cambodia; and
- d) Work with relevant government agencies, designated community enforcement groups and civil society organizations to strengthen and/or establish a mechanism of reporting and managing cases of gender based violence among women and children in the community.

Mercury Awareness

Finally, awareness-raising initiatives need to be conducted to ensure that local communities are aware of the risks involved in ASGM, particularly in handling mercury. As identified during the study's implementation, communities and miners alike are not aware of the impacts of mercury use. Most mine workers handle mercury with their bare hands, and children play around the smelting areas. Moreover, mercury-containing wastes are disposed of improperly. This may eventually lead to long-term health and environmental impacts for whole communities.

As such, specific interventions may include:

- Integration of Cambodia's national action plan on mercury with provincial level plans;
- Greater awareness raising on the impacts of mercury to the environment and to the health of the groups exposed to mercury directly and indirectly such as women and children;
- Integrate awareness raising sessions on mercury toxicity and its impacts in schools within mining communities.

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