



Yayasan Tambuhak Sinta
Final Report
UNEP MERCURY PROJECT

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Abbreviations

ASGM	Artisanal and Small-scale Gold Mining
BPPT	Agency for the Assessment & Application of Technology
GOI	Government of Indonesia
MOEF	Ministry of Environment and Forestry
MOEMR	Ministry of Energy and Mineral Resources
NAP	National Action Plan
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
WOA	Whole Ore Amalgamation
WPR	Community Mining Area (<i>Wilayah Pertambangan Rakyat</i>)
YTS	Yayasan Tambuhak Sinta

1. Executive Summary

YTS project activity has included constant interaction with a wide variety of stakeholders, ranging from individual male and female miners in the field, to ore processors and gold shop owners in ASGM communities, and to government at the village, district, provincial and national levels.

During this project, YTS has performed field activities in four provinces:

1. South Kalimantan – field surveys and mapping of ASGM sites
2. Central Kalimantan – recycling interventions and mapping of ASGM sites
3. Central Java – action-research into super-concentration using flotation methods
4. East Java – baseline study, establishment of mercury-free training centre, training-of-trainers, and miner-to-miner demonstrations using both simple and more advanced technologies

In April and May, YTS conducted a scoping survey of all mining and processing sites in the Banjar region of South Kalimantan. We also conducted a survey to identify ASGM sites in the region of the Meratus mountains and in the districts of Banjar and Tanah Laut near the capital city of Banjarmasin. The purpose of the scoping survey was to seek new sites, accessible by road from Palangkaraya.

During the same period, in Central Kalimantan, we visited several ASGM sites at Mt Muro (a major site for mercury emissions) to monitor recent developments there and to provide high quality retorts to miners. We also visited a number of gold shops and installed mercury condenser systems at various locations within the province. In addition, the health awareness campaign continued to reach out to women and children through schools and village health clinics in both provinces.

In June, we returned to the district of Banyumas in Central Java, where we conducted geological sampling, followed by laboratory testing, in an effort to improve our technical recommendations on treatment of the ore for the benefit of the miner's cooperative and the mining department. To obtain the mercury-free samples of mineral concentrate required, YTS conducted a series of mercury-free demonstrations to several groups of miners in the village of Paningkaban, processing many sacks of ore over several days. The concentrate was sent to Jakarta for further testing using flotation methods, which proved to be quite successful, thereby providing a feasible alternative to direct cyanidation.

In late June, we had the opportunity to discuss our project activity with the Ministry of Energy and Mineral Resources (MOEMR). As a result, we decided to respond to their request for the project to conduct mercury-free demonstrations with a formalized ASGM community in the village of Kebonsari, in Pacitan regency in East Java. Project work began in this village at the start of July. During our first site visit we commenced a baseline survey, conducted ore tests, and began government-relations work; before establishing a mercury-free processing facility in collaboration with the local community and the district mining department. By September, the facility was running properly and we had trained three local miners to operate it independently. We then moved into a training phase, providing daily demonstrations to the local miners. In the last two months of fieldwork, the project conducted 37 training events: with 17 demonstration days held in October, and 20 demonstration days held in November. In all, 74 miners attended these events, thus almost all of the miners in the village took part in the training.

While conducting fieldwork in Kebonsari, the project also held two national workshops events in Jakarta. The substance of these workshops can be summarized as addressing policy strategies for ASGM while also providing basic guidance on technical approaches. Detailed reports of the proceedings of the workshops can be found in the annexes.

2. Introduction

2.1. Background

Since 2006, YTS has worked with UNIDO, UNEP, the Blacksmith Institute, and other donors to support the Government of Indonesia (GOI) to reduce mercury use in artisanal gold mining, by conducting mercury-recycling interventions, and by carrying out action-research into practical methods of mercury-free processing.

In 2014, YTS first began to pioneer a new method of gravity concentration that uses a natural fibre (*ijuk*) as a filtration mechanism for slurry that effectively separates lighter minerals from heavier minerals while retaining microscopic gold in the concentrate produced. YTS has pioneered the use of this method at hard-rock processing sites, and recommends its use as an alternative to the practice of whole ore amalgamation. We have named this process the ‘Manado Method’ in recognition of the traditional and on-going use of the *ijuk* material by alluvial miners in Northern Sulawesi.

YTS first field-tested the method at Artisanal and Small-scale Gold Mining (ASGM) sites in West Sumbawa, and subsequently documented the mercury-free process and its application in a training video that is available in both Indonesian and English language versions. The video is a very useful training tool, but cannot substitute for practical hand-on demonstrations and miner-to-miner training. Thus, the aim of this project has been to provide such training in an effort to demonstrate a practical alternative to the use of mercury in ore processing.

2.2. Project Sites

There are currently estimated to be around one thousand active ASGM sites in Indonesia, making it seem that there are many sites at which this project could choose to operate. However, access to sites is restricted by the fact that community mining is considered illegal in Indonesia, unless it takes place in designated community mining areas. Thus, these regulatory constraints forced us to give careful consideration as to where to conduct our field demonstrations. On this matter, the project consulted closely with the national government regarding suitable sites for technical interventions. As a result of the recommendations made to YTS by the Ministry of Energy and Mineral Resources (MOEMR) in June 2015, the project chose to focus on two sites in Java that were considered to be priority sites for interventions by the national government. Thus, the project has focused on seeking alternatives to mercury use in the District of Banyumas in Central Java, and in the District of Pacitan in East Java.

2.3. Approach

YTS has pursued a strategy of both top-down and bottom-up approaches. That is to say, on policy matters, the project has worked from the top-down, but on technical matters, the project has taken a bottom-up approach. This has encouraged participation from various levels of government, as well as from the ASGM communities at the project implementation sites. Working within the ASGM community has also allowed us to feed practical information about the realities of field interventions to the national government. This ability to inform government about realistic community-based approaches, informed by real field data is considered to be one of the strengths of the project.

It may be that aspects of this approach do challenge the dominant top-down paradigm of decision-making, and the underlying development discourses. For although the gradual process of formalization of ASGM in Indonesia will eventually lead to the formation of legal cooperatives and legally-established groups of miners that may be in a position to adopt more capital-intensive technologies, this is currently not the case. It is for this reason that YTS has sought to demonstrate that gravity concentration and separation can provide an accessible alternative to mercury, using methods that are neither capital-intensive nor overly sophisticated.

3. Project Activities by Month

3.1. April

Field activities began with a survey of ASGM sites in two districts (Banjar and Banjarbaru) in South Kalimantan starting on April 1st 2015. Having already determined that most of the readily accessible Whole Ore Amalgamation (WOA) sites were located in the southwestern corner of the province, the team first visited ASGM sites in Martapura, Pumpung, and Aranio. In Martapura, there was no evidence of amalgam-burning in the Batuah gold market, although there were many handicraft shops selling gold, silver, and gemstones. In the nearby village of Pumpung, the team identified thirteen alluvial operations for mineral sands, gold and diamonds. However, each unit only produced one gram of gold per day. Moving on, into the subdistrict of Aranio, the villages of Bunglai, Artain, and Poliin were identified as more substantial ASGM locations. The area had been the subject of recent police actions, so the miners were working covertly at night. Nonetheless, the dwindling gold reserves and the raids had caused some miners to move to other areas, such as to Paramasan in Banjar District, and to Pelaihari in Tanah Laut District. Towards the end of the month, the team conducted further field investigations in Tanah Laut District, visiting the four sub-districts of Pelaihari, Bajuin, Tambang Ulang and Batu Ampar. We found most of the ore-processing sites to be located far from the mining sites. Furthermore, the processing sheds were generally scattered around the fringes of villages, except in the case of Karang Jawa where we found a large cluster of processing sheds in a busy residential neighbourhood. Here, there are more than thirty processing sheds in one location, attracting many miners from Karang Jawa, Martadah, and Tebing Siring, who bring their ore to this spot for processing. Given the high density of operations, and the high level of mercury emissions taking place within a small township, Karang Jawa was considered to be the most meaningful location at which to conduct a demonstration project.

3.2. May

In May, the team made another field trip to South Kalimantan to perform a more detailed study of the processing site of Karang Jawa, in Karang Taruna village in the subdistrict of Pelaihari. At this time, the team collected baseline data, and built a good relationship with the staff at the subdistrict health clinic (*Puskesmas*). Primary data was collected from respondents working as miners and processors. We found they had high monthly incomes, in the range of Rp. 3,000,000 to Rp. 5,000,000 or more.

Secondary data was collected from men and women exposed to amalgam burning activities. Overall, their level of knowledge about the dangers of their exposure to mercury was very low. None of the respondents thought mercury was dangerous to their health, and they did not believe they were exposed to mercury emissions in any form; even though they had been using it for many years. They did not have any knowledge about alternative gold processing techniques, saying there was no other way to capture gold except by using mercury. They were not aware of the benefits of using retorts.

Having identified Karang Jawa as an important processing site, this information only reinforced our wish to conduct interventions at this location. However, after a careful analysis of the socio-economic relationships between the miners and processors we realized that establishing a centre at the Karang Jawa site would be highly problematic. The main reason for this is that all of the processing sheds at this location operate on a for-hire (*rental*) system whereby the miners bring their own ore to the shed for processing by the shed workers at no cost. The owners sometimes also provide the mercury free of charge. The caveat to this arrangement is that the miners must leave their tailing waste behind and this then becomes the property of the processor. As mercury is highly inefficient at gold recovery, only half of the gold is extracted from the ore during this initial process, meaning that the remaining half becomes the property of the processors. The introduction of a more efficient mercury-free method that

can extract most of the gold during the initial processing run would therefore be very detrimental to the business interests of the processors operating on the 'rental' system.

There were also strong signs of involvement of the security apparatus in all the ASGM activities, but particularly in the ownership of cyanide installations and in the gold market. We considered that successful project activities might also lead to the demise of these business interests, as cyanide tank owners also reap their rewards from the reprocessing of mercury-contaminated tailings.

After considerable deliberation among the team members, we decided that it would not be wise to choose this location as the site for a mercury-free demonstration centre, despite the obvious need for some form of intervention to prevent the high level of mercury emissions in the township.

3.3. June

In June, the team leader decided to switch the attention of the project to Central Java. In the village of Paningkaban, in the district of Banyumas, we had an existing relationship with a miner's cooperative that is in full control of all aspects of mining and processing of their ore. Thus, the purpose of the June mission to Banyumas district was to conduct further action research there, in an effort to develop a mercury-free solution for the processing needs of the cooperative. These efforts were made in response to the District Mining Agency's request for further technical assistance, and to seek an alternative that would require neither mercury nor cyanide.

Consequently, the June field mission was to the mining site of Igir Salak in Paningkaban village, and took place from June 3rd – 13th 2015. Our main objective was to obtain mercury-free samples of mineral concentrate for further testing, by working with members of the miner's cooperative. YTS conducted three mercury-free processing runs, and produced 30 kg of concentrate for further testing. These activities were coordinated together with the head of the mining cooperative in Paningkaban Village and one local champion from Cihonje Village. The samples of concentrate were carefully analyzed for gold content, and then subjected to testing using a variety of concentration methods.

The testing proved that further gravity concentration is possible here through flotation methods. It was possible to upgrade the concentrate sufficiently to allow for smelting of the super-concentrate proving that gravity concentration remains an alternative to mercury and cyanide at this site.

3.4. July

An initial scoping study of the village of Kebonsari in Pacitan District took place from July 3rd- 9th. Having previously made informal contact with the district mining agency, the team then met with the agency head, Bapak Ir. Setyo Utomo, on July 8th 2015. We received his full support for our project activity, and he asked one of his staff to provide us with field support. The team went on to visit the village of Kebonsari with assistance from the district mining agency. First, we visited the licensed community mining sites, where we found most of the miners to be from the village itself, with only a few outsiders active in the village. We found there to be three sites where miners dug for ore: on three small hilltops named Pandan, Kendalisodo, and Tumo. Most miners carried the ore down to their homes where they milled it with mercury. Only a few miners processed ore at the mining site itself. Furthermore, we found that very few miners worked at this activity all year long. Most were seasonal miners who only mined during the dry season, working from between one to six months a year, and returning to their rice farms with the rains.

Following the visit to the mining areas, the team visited mining households with backyard processing sites. Here, we conducted interviews and collected data. We were also seeking a suitable site at which to establish a demonstration centre for future project work. Fortunately, a disused processing station was discovered near the roadside, with good accessibility and visibility. The station had been disused

for eight months and most of the equipment had been removed, but we realized it could be made operational with some renovation and restoration. After negotiating to rent the site on a monthly basis, we decided to return at the end of the month to begin the work needed to make the station operational. The site is located in the hamlet of Ngasem. It was agreed that Pak Yono, one of the community leaders in the village, would assist with the renovation work and provide us with a supply of ore.

3.5. August

The team returned to Kebonsari in late July, to work on the renovation of the station. First, the YTS team cleaned up the surrounding area and removed the contaminated tailings waste at the site. We then excavated the area, and built a settling pond for the tailings waste that would result from our demonstration activity. This compartmentalized pond was constructed with brick and lined with cement. The team also constructed a smaller pond, to be used as a panning pond. The tailings pond was designed to filter the runoff from the station so that all of the water could be recycled, by pumping to a holding tank located on the hill above the station. The filtration and water recirculation back to the tank allowed us to store the tailings on-site without any runoff occurring. We also purchased an additional water tank, submersible pumps and hoses to ensure a sufficiency of water.

To renovate the grinding station, the team started by fitting new wooden bearers and new bearings before adding four new grinding drums. The team also obtained a new electric motor to power the drums and a backup generator was purchased in case of power outages. The station was operational by the middle of August, and was completed with signage to signify its availability to the community as a government-approved demonstration and training centre for miners.

In addition to the renovation work, the team also conducted a survey of all mining households in the village. The purpose of this was both to make initial contact with the entire ASGM community, as well as to collect baseline information related to mercury use and perceptions about mercury hazards.

3.6. September

On September 1st, the project held a multi-stakeholder workshop in Jakarta, hosted by the Ministry of the Environment and Forestry (MOEF). The workshop was entitled: “Technical and Policy Approaches for Mitigation of the Impact of Mercury in Artisanal and Small-Scale Gold Mining in Indonesia” and brought together seventy representatives from central government ministries, sub-national governments, international institutions, NGO’s, universities and foreign embassies. This one-day workshop provided a forum for discussion and capacity-building on several key issues: such as how to strengthen the legal framework to allow a degree of formalization to take place in ASGM; how to further develop the National Action Plan (NAP) for mercury reduction in ASGM; and how to promote zero-mercury technologies to miners. The outputs from the workshop set a series of further stakeholder meetings in motion, and the project actively participated in many of the resultant discussions on government policy and practice.

The September field mission ran from August 27th to September 10th. During this time, the team finalized the baseline survey in the village of Kebonsari, and identified the social and institutional channels available for the awareness-raising campaign. The team also set about improving the processing facility to be ready for use: for before we could commence the mercury-free demonstrations, we had to clean the drums and sluice channels of all residual mercury, using limestone and dilute nitric acid. We then consulted with local miners to obtain ore for the training events. Two miners provided the project with ore, from the Tumo site and the Kendalisodo site respectively. Approximately 1,000kg of ore (30 sacks) was processed during the September mission.

At the start of the month, we hosted an official visit by the district government departments of Mining and Environment. United Nations Environment Programme (UNEP) representative, Kenneth Davis, also visited the site at this time. Prior to the fieldtrip, the team visited the District Head and got his official endorsement for the activity.

Training of trainers took place from August 30th to September 6th. By the September 3rd visit, the team was able to demonstrate sluicing, panning, and direct smelting, however the overall gold recovery was very low due to the very low grade of the ore provided. This initial demonstration of the method was rather hurried and the overall effect was unfortunately diminished by the low gold recovery. The YTS team continued up-skilling the two local team members, up to a point at which they were able to perform all of the processing functions by themselves. At the same time, we had visits from several local miners interested in learning the process themselves. Later in September, the local team obtained fresh ore for the upcoming demonstrations to the wider mining community.

3.7. October

The October mission ran from September 30th to October 21st and included a total of seventeen demonstration and training days. Over this period, the team conducted demonstrations with miners, and actively involved the head of the neighbourhood, as he had a fresh supply of ore. Neighbouring miners visited the site and actively participated in the demonstrations held on these days.

Over this period, YTS also began the health awareness campaign, reaching out to mining households, by making personal visits to their homes. In all, our campaign messaging was delivered to 112 people from both our primary target group (miners) and secondary target group (women).

At the start of the month, Dr. Kevin Telmer visited the site. He recommended that we try raising the height of the sluices so that they would be pitched as steeply as possible. This would result in the sluices retaining less concentrate. We implemented this recommendation and it proved beneficial. Having raised the sluices, we recovered much smaller amounts of concentrate, but no gold was lost.

Over the course of the month, the team processed 1,500kg of ore with zero-mercury methods. Later, we reprocessed 42 buckets (250kg) of concentrated tailings from the panning pond using conventional whole ore amalgamation methods (at another location). This was to test whether we had lost any gold that could otherwise have been recovered using mercury. There was absolutely no amalgam created as a result, proving that we had lost no gold from the sluicing and panning process.

At the end of the October mission, a five-kilogram sample of concentrate produced at the site was taken to Palangkaraya for further testing on a shaking table. The shaking table was able to achieve good separation of the gold. Because of the good results, we decided to ship the table to the site to improve our demonstrations, and the attractiveness of the facility to the miners.

3.8. November

The November mission ran from November 6th to November 30th and included a total of twenty demonstration and training days. Most of the miners in the village attended over this period. In contrast to the October demonstrations, miners were also able to learn about the operation of the shaking table and compare it to the panning process. Having the shaking table at the site was an added attraction, as miners were curious about its operation and were drawn to the site to see how it worked.

In this last field month, we continued intensively with the health awareness campaign, and community support was demonstrated by making handprints on banners (displayed at the closing workshop). Several different banners were made, representing support from miners, women, and children.

The local mining department representative continued to visit the site, learning more about the nature of the gold by witnessing our recovery from the shaking table. A team from the provincial office of the Environment also visited the site briefly, although their main ambition was to see the physical degradation on the hill from the mining process. During their short visit to our facility, we gave them a briefing about our work and the need to address the mercury usage and the fate of tailings.

On November 30th, the project held its closing workshop in Jakarta, entitled ‘Progress Update on the Technical and Policy Approaches to Mitigation of Mercury Use in ASGM’. As with the initial workshop, it was hosted by the Ministry of Environment and Forestry and was attended by both government and civil society. The workshop provided a unique opportunity for policy discussion between the relevant ministries of the national government.

3.9. December

The closing workshop marked the end of project implementation, and there was no field activity in the month of December. However, there was still much to do in the YTS office in terms of financial and other reporting. The YTS field team spent the final month collating their data for the final report and the November field expenses were compiled. Photos and other data were also compiled for reference.

By teleconference, YTS held a final project coordination meeting with Ibu Lana of MOEMR and learned that Kebonsari would now become a pilot site for government assistance. As in Banyumas, and as recommended by BPPT, the ministry will provide a small-scale cyanide processing plant to the miner’s cooperative as an alternative to mercury.

In December, YTS attended a meeting held by the Coordinating Ministry of the Economy in Jakarta. The purpose of the meeting was to seek solutions to ASGM problems in general, not only mercury. Three presentations were made, followed by a focus group discussion. Although the thinking of government remains oriented towards eradicating illegal mining, there were some associated efforts made to characterise the nature and extent of ASGM in Indonesia. A presentation by the head of the Indonesian Mining Institute stated the need to establish more legal community mining areas, and noted that gold mining is considered to be a traditional livelihood activity in many provinces of Indonesia. This was the first in what is likely to become a series of meetings held by this ministry and took place due to a recent presidential decree on ASGM. We see this as a progressive development, both because the economy of ASGM is being considered seriously, and because various ministries are being invited to what looks to be an on-going dialogue.

4. Initial Stakeholder Consultations

4.1. National Government

From the start of the project, YTS made an effort to seek letters of support from relevant ministries in Jakarta; however, we found that most government ministries were in the process of being reorganized after the national election, and this was especially true of the Ministry of Environment, as it had only just been merged with the Ministry of Forestry to become the Ministry of Environment and Forestry (MOEF). We were advised to wait for new director-generals to be appointed before determining a focal point for the project. Realizing that we needed to closely monitor the changing situation, we sought the assistance of Ibu Budi Susilorini from the Blacksmith Institute Indonesia to assist us to strengthen our government relationships in Jakarta.

4.2. Ministry of Energy and Mineral Resources

In June, YTS met with the Ministry of Energy and Mineral Resources (MOEMR) to share information and garner support for this project. One of the main considerations from MOEMR was that the project should operate in an existing and licensed community mining area (*Wilayah Pertambangan Rakyat*) also known as a WPR area. The Ministry explained that although few WPR areas have been defined in Indonesia to date, the Kebonsari site in East Java and the Lebak Gedong site in West Java were considered to be their current priority sites, and these were both WPR locations where technical interventions and assistance could legally be provided for ASGM. At this time, we also discussed MOEMR's immediate plan to work with BPPT to provide technical assistance in the form of a government-sponsored cyanide plant at the Paningkaban site in Central Java.

YTS had previously conducted demonstrations of the Manado Method at the Paningkaban site, and had built a good working relationship with members of the miner's cooperative. In response to the recommendations made by MOEMR, we decided that we would instead relocate this project to the legal community mining area in the village of Kebonsari in the district of Pacitan in East Java.

The Pacitan District Government has been highly supportive of our field program in the village of Kebonsari. Here, the project hopes to be able to demonstrate the environmental, community health, and economic benefits to be gained from mercury-free processing. In Kebonsari, much of the ore is oxidic by nature and therefore more amenable to processing without mercury. The results of our tests showed that the free gold is easy to separate, and therefore we expect to prove that gravity methods will result in better gold recovery for the miners, as our innovative concentration technique minimizes the loss of fine gold to the tailings. If so, we may also prove that minimizing the use of mercury not only reduces emissions, but also lowers production costs, and increases miner's incomes.

4.3. Ministry of Environment & Forestry

The project's first meeting with MOEF was held on 26th June 2015. We met with the new Director General of Waste Management, Ibu Tuti H. Mintarsih, and the Director for Management of Hazardous Waste, Ibu Yun Insian, as well as the Division Head for monitoring of Hazardous Waste, Bpk. Fery Huston. At the meeting, Ibu Tuti agreed to act as the focal point for the project. MOEF agreed that the project could operate in Pacitan, as the community mining area in Kebonsari had been proposed by MOEMR and was supported by the District Mining Agency (Distamben). With regard to the Paningkaban site in Central Java, MOEF explained that although the District Mining Agency of Banyumas has committed to a process of formalization of ASGM, the site has yet to be declared a community mining area and the licensing process has currently stalled. Nonetheless, the government has prioritized the site for a pilot project that can serve as a model for technical interventions.

The project held a second meeting with MOEF on the 10th of August, chaired by the Director of Hazardous Waste, Ibu Yun. A summary of outcomes is as follows:

The project presented the Terms of Reference for the national workshop to be held on 1st September and this was revised based upon inputs from the meeting, including by making additions to the list of participants, and by defining contacts in the designated divisions. MOEF agreed to host the workshop in their own building and to provide a resource person to act as moderator. The MOEF offered to invite sixty participants including various government ministries, NGO's, and donors. A draft invitation was submitted to MOEF for distribution.

YTS discussed the action-research to be implemented as follow-up to our initial survey of Pacitan, and our intention to conduct demonstrations and trainings from September to November 2015, following the strong show of support we received from the District Mining Agency of Pacitan as well as the mining community at Kebonsari village.

MOEF invited YTS and Blacksmith to join in discussions concerning the national ASGM inventory, to be held in Jakarta at some stage after the national workshop. Furthermore, as the project was expected to wrap up in December 2015, it was agreed that a second workshop involving MOEF, MOEMR, YTS and Blacksmith would be held by the first week of December 2015. At this time, YTS was asked to provide written recommendations to the Government of Indonesia based on the project findings, in order to support the implementation of the National Action Plan (NAP) at both policy level and regarding technical assistance in the field. The MOEF perceived the project to be a part of their NAP implementation. Therefore, they wanted to take a measure of ownership as well, and ensure that there would be transfer of knowledge throughout the project. Thus, MOEF appointed certain staff to liaise with the YTS field team and to visit the field site.

MOEF was keen to monitor the outcomes of the project, and may provide subsidized equipment and materials to the local government or mining community as an incentive to shift to non-Hg techniques. Staff persons from MOEF were appointed to attend the training events held at the Kebonsari site, as they wished for transfer of knowledge from the project. Depending on project success, they hoped to design a 'support package' for the community based on our recommendations.

MOEF requested our assistance to prepare technical guidelines for more sustainable mining and processing techniques, as an output to be used in the final draft of the current revision to the law that was to be completed by the end of the year. They also asked us to provide a matrix of different technologies comparing their uses and benefits. We discussed the need for solutions for individual miners and processors, not just for groups, as there needs to be a solution for operators with no capital as well as capital-intensive solutions that can be adopted by miner's cooperatives and groups.

5. Project Communications & Outreach

5.1. Central Kalimantan

YTS is based in this province and can therefore operate here very cost-effectively. Recently, we have also considering expanding our field program to include South Kalimantan, as there is a lot of ASGM activity in both provinces. As part of this project, a map of ASGM sites in Central Kalimantan was created, based upon our working knowledge of field sites and the location of our interventions to date. This map is provided in the annexes. A special focus area within the province is the Mt Muro site. This commercial gold mine is a global hotspot for mercury releases from ASGM due to the high silver content of the ore, the large number of artisanal miners, and the extremely high rates of mercury use. Mercury emissions at Mt Muro are estimated to be between 50,000 to 100,000 kilograms per annum. This has been the case for the last eighteen years or more. The village of Mangkahui is one of the largest ore-processing sites at Mt Muro, and was recently revisited by our team. Our recent estimates for annual mercury releases (from this village alone) are shown in the table below:

Village Name	Desa Mangkahui
Average Gold Production per Tromol/Day	2 grams of gold
Estimated Number of Tromols	500
Mercury Inputs per Tromol/Day	2,000 grams of mercury
Mercury Loss per Tromol/Day	200 grams (10% rate of loss due to high silver)
Estimated Annual Emissions of Mercury	500 tromols x 200g x 300 days = 30,000 kg

Table 1: Gold Production and Mercury Consumption in Mangkahui Village

5.2. South Kalimantan

ASGM activity is also widespread in this province, with many alluvial miners operating in the Meratus mountains in the centre of the province, as well as large numbers of hard rock miners working at very remote sites in the north and northeast of the province. Unfortunately, the remote nature of these locations makes them difficult and expensive to reach. During this project, our field team instead made several trips to South Kalimantan in order to identify other ASGM sites lying in the south of the province near the capital of Banjarmasin. A map of all of the ASGM sites identified by our field survey is provided in the annexes. Most of the ore-processing locations were individually scattered around the fringes of villages at a distance from the mining areas. The largest whole ore amalgamation site discovered by the team was in the township of Karang Jawa in the subdistrict of Pelaihari. Here, we counted three hundred grinding drums (in Indonesia an individual drums is called a *tromol*) operating side-by-side within a housing area, leading to around 1,800 kilograms of mercury emissions per year as shown below:

Village Name	Karang Jawa
Average Gold Production per Tromol/Day	1 gram of gold
Estimated Number of Tromols	300 tromols
Average Mercury Inputs per Tromol/Day	400 grams of mercury
Average Mercury Loss per Tromol/Day	20 grams (minimum 5% rate of loss)
Estimated Annual Emissions of Mercury	300 tromols x 20g x 300 days = 1,800 kg

Table 2: Gold Production and Mercury Consumption in the Karang Jawa Township

5.3. Central Java

YTS has done in-depth investigation of two mining communities in this province, at Desa Jendi in the district of Wonogiri and at the neighbouring villages of Paningkaban and Cihonje in the district of Banyumas. Previous fieldwork in Banyumas has involved conducting ore tests, demonstrations of the Manado Method, comparisons of gold recovery and mercury loss, reprocessing of concentrates, treatment and testing of tailings, a health awareness campaign, and coordination with government and cooperative leaders. The tests and demonstrations were all conducted at the active mining site of Igir Salak, in Paningkaban village. Over this period, we were able to introduce the concept of amalgamation of concentrates as an alternative to whole ore amalgamation but we were unable to continue to the direct smelting stage, due to the presence of large amounts of both pyrite and galena in the mineral concentrate. YTS decided to return to the village as part of this project to conduct further tests to see if this problem could be overcome by means of a second-stage super-concentration process using a flotation tank and selected reagents. The villages of Paningkaban and Cihonje together form a major mining site, having approximately 5,500 miners and 2,000 tromols. Our recent estimates for mercury releases from this village are shown in the table below:

Village Name	Desa Paningkaban & Desa Cihonje
Average Gold Production per Tromol/Day	1 gram of gold
Estimated Number of Tromols	2000 tromols
Mercury Inputs per Tromol/Day	200 grams of mercury
Mercury Loss per Tromol/Day	10 grams (at minimum 5% rate of loss)
Estimated Annual Emissions of Mercury	2000 tromols x 10g x 300 days = <u>6,000kg</u>

Table 3: Gold Production and Mercury Consumption in Paningkaban/Cihonje

5.4. East Java

The first field visit to Pacitan District took place in July, following the recommendations made by the by MOEMR and MOEF to conduct the project in a location with a designated community mining area. The village of Kebonsari has two individual mining licenses (IPR) within the community mining area (WPR). Here, the district government acknowledges that ASGM can create job opportunities and increased community income. They also acknowledge the need for sustainable management and the application of environmental preservation guidelines. The YTS team worked closely with the district mining agency in the implementation of this project. The village of Kebonsari has a small ASGM community of only 87 households. The whole ore amalgamation practices are very similar to the villages we have studied in Central Java. Our recent estimates for mercury emissions from this village are shown in the table below:

Village Name	Desa Kebonsari
Average Gold Production per Tromol/Day	0.5 gram of gold
Estimated Number of Tromols	300
Mercury Inputs per Tromol/Day	100 grams of mercury
Mercury Loss per Tromol/Day	5 grams (at minimum 5% rate of loss)
Estimated Annual Emissions of Mercury	300 tromols x 5g x 150 days = <u>225kg</u>

Table 4: Gold Production and Mercury Consumption in Kebonsari Village

5.5. Discussion

From the above data, we can see that there is a wide range in the estimated annual mercury emissions from each of the selected study sites. The large differences are due mainly to the different scales of mining and processing capacity in each village, rather than fundamental differences in the nature of the processing. There are however, several variables that influence the rate of loss from the grinding drums (*tromols*) including the amount of mercury input to the drum – as this varies according to the culture of mercury utilization in the area. Generally speaking, miners increase their use of mercury with better quality ore due to the expectation of greater gold recovery. However, we can see that miners in Java are far more frugal with their mercury inputs than miners in Kalimantan, leading to less mercury lost to tailings. Other variables relate to the nature of the ores being processed, as those ores with higher metal content will lead to greater losses of mercury to tailings and amalgam.

6. Initial Workshop

6.1. Ministry of Environment and Forestry

Preparations for the first national-level workshop required close coordination with the Ministry of Environment and Forestry: the main counterpart for the project. Preparations for the initial workshop began in June, immediately after our first meeting with the Directorate General of Hazardous Waste. The Ministry elaborated several priorities for its ASGM program, including:

- strengthening of the existing legal framework on ASGM and mercury
- ratification of the Minamata Convention (and compliance with the Annexes)
- development of a national action plan for mercury reduction
- promotion of environmentally-friendly technologies for ASGM

Thus, the Ministry has an obligation to provide technology, training, and other forms of support to ASGM communities in order that they may transition away from mercury use. In this context, our project was seen to be offering appropriate-technology solutions for mercury in ASGM.

6.2. The Initial Workshop

The initial workshop, hosted by the Ministry, was entitled ‘Technical & Policy Approaches to Mitigation of Mercury Use in ASGM’. This initial workshop had the objective of bringing key stakeholders together to discuss the immediate strategies that government can undertake to reduce mercury emissions from ASGM. Seventy people attended, representing government institutions, local and foreign governments, international institutions, universities and NGO’s.

The morning of the initial workshop was devoted to presentations regarding technical aspects, and YTS presented some lessons learned through action research at project field sites. The afternoon session was devoted to presentations regarding better policy approaches and lessons learned by the YTS-Blacksmith Institute partnership in Indonesia. The technical presentation from YTS focused on the following discussion points:

- Baseline Methodologies for Quantifying Mercury Emissions
- Exposure Pathways and Populations at Risk
- Unacceptable Risks and Minimum Standards
- Setting Priorities for Successful Interventions
- Zero Mercury Alternatives and Appropriate Technology
- Project Workplan and Timeline

The YTS presentation included using a triangulation model to explain how mercury consumption relates to gold production, and how hard rock mining with whole ore amalgamation is a far more significant problem than alluvial mining in terms of mercury pollution.

The policy presentation from Blacksmith Indonesia focused on two discussion points:

- Policy Review and Recommendations to Improve Ministerial Regulation No. 23/2008
- Road Map Proposal to Eliminate Mercury Use in Indonesia

These policy discussions were part of an on-going process to bring key stakeholders together to agree on their various roles and responsibilities regarding practical implementation of the National Action Plan on Mercury Mitigation. The road map being developed by Blacksmith Institute was considered to be an effective tool to allow for greater coordination between the various ministries.

6.3. Summary

There was general acknowledgement from the various ministries present of the urgent need to tackle mercury pollution from ASGM, the need for alternative technology, the need to update the NAP, and the need to conduct further inter-ministerial coordination for implementation of the NAP. Clearly, both MOEF and MOEMR are committed to mitigating mercury in ASGM, including facilitating the involvement of NGO's. MOEF have said that their own efforts will be insufficient and they need the active involvement of NGO's to implement the NAP. The MOEF was especially open to inputs from the project regarding changes to government policy on mercury reduction and elimination strategies.

Although the MOEF plans to establish a multi-stakeholder forum to meet every six months there has been little stakeholder engagement to date by the relevant ministries, and miners have not been consulted about their role. Greater government commitments to ASGM formalization are required by government to secure equal commitments from artisanal miners. Local governments also need to be consulted and directed. So far, the central government has not demonstrated a well-coordinated strategy to connect with provincial and district governments with regard to ASGM. Furthermore, local governments consider it onerous to implement the changes. But they are looking for ways to control ASGM proliferation and are enthusiastic to cooperate with MOEF on inventory of mercury use, promotion of non-mercury processing techniques, and cleaning up contaminated sites. Whereas it will be important for local governments to have sufficient financial resources to do this, it will be equally important for them to have replicable and cost-effective solution packages to eventually roll out.

Further to the workshop, a series of follow-up meetings were held to develop recommendations for ways to harmonize the existing NAP with the Minamata Convention. This was done with reference to the draft 'Guidance Document for Developing a National Action Plan' provided by UNEP. The implementation of the NAP requires the GOI to elaborate a list of detailed activities (with feasible timelines and targets) and to delegate tasks and responsibilities to different ministries.

7. Baseline Studies & Action Research

7.1. Central Java

The village of Paningkaban is in the district of Banyumas in Central Java. ASGM is one of the major livelihoods in the village, and a group of local miners have formed a cooperative here. In June, YTS revisited the community with a view to conducting action-research on the problematic lead-zinc ore mined in the village. The high content of lead in the ore adds an extra dimension to the problem of heavy metal contamination in the village, as is the case at many ASGM sites where lead-zinc ores are mined. The main difficulty with gravity processing of this ore is the dominance of massive pyrite and galena. Whereas the Manado Method of sluicing with *ijuk* fibre works well to produce a concentrate, it is not possible to produce a super-concentrate or separate the gold out with a gold pan.

YTS has an existing relationship with the head of the miners cooperative in Paningkaban, so we were able to work at her processing site to obtain the mercury-free samples of concentrated ore needed for our research. We did this by working with her team and by using the Manado Method. As YTS had already conducted training in the amalgamation of concentrates at this site during 2014, our intention was to see if we could find a more comprehensive processing solution to offer the miners.

At the same time as conducting our mercury-free processing activities to obtain the concentrates, we were able to compile some baseline information for the site as follows:

1. The average age of a miner is 38 years old. Most have been working full-time as miners for the last 1-10 years, and usually receive an income of Rp. 1-3 million per month. This covers the living costs of 3-4 of their family members. The highest rates of gold capture per month for most respondents were between 30-100 grams, and the lowest rates were 4-15 grams.
2. Average mercury utilization rates were established to be 200-300 grams per tromol/day. Loss is 10g per tromol/day. Some miners purchased low-quality local mercury (produced in Indonesia) for Rp. 250,000 per kg, whereas others used imported mercury purchased at Rp. 800,000 per kg.
3. 100% of respondents agreed that mercury was dangerous to human health. But only 44% felt that they were exposed to mercury, whereas 56% felt free from exposure.
4. The majority of respondents believed that gold could also be captured without mercury, such as by panning and other gravity methods. Only a small number of respondents thought that gold could only be captured by mercury.
5. There are an estimated 5,766 local miners working at this ASGM site in Central Java.

The District Mining Agency estimates that there are 3,303 miners and 1,324 tromols in the village of Paningkaban alone. The neighbouring village of Cihonje is estimated to have a further 2,142 miners and 756 tromols. Milling is done in small tromols of 10kg capacity. Ore is milled for three hours before mercury is added. Around 100g of mercury is added to each tromol, then run for one hour to perform the amalgamation. A set of ten tromols will therefore utilize 1kg of mercury for the initial amalgamation. Although Whole Ore Amalgamation (WOA) is a worst practice, it can be said that the miners here are more conservative with their application of mercury than at many other WOA sites. Nonetheless, floured mercury is certainly created, and we estimate 90% of the mercury loss is to the tailings and only 10% to amalgam.

Miners are only entitled to mill the ore once; after that the tailings become the property of the shed owner. These bosses generally reprocess their tailings one or two times, but far less mercury is added. When reprocessing tailings, only 50g of fresh mercury is added to each tromol, as the bosses are aware that the tailings are already mercury-rich. About half of the tailings contain sufficient gold to be reprocessed in this way, usually only once, but sometimes twice, if further gold can still be extracted. The tromols are usually run twice per day, once in the morning, and once in the afternoon.

Some bosses claim that all reprocessing is uneconomical, citing the major costs as labour, electricity, and mercury. They prefer to sell their tailings instead. Most of the tailings are stored on site or used for terracing the hillside. Measurements of mercury contamination in tailings showed readings of 200ppm up to 600ppm. Lead content was discovered to be 40,000ppm on average. Tailings are tested to check the quantity of residual gold before they are sold. About one quarter of the total tailings are sold on to cyanide processors. Tailings are sold for up to one million rupiah per cubic metre.

There are a total of 23 cyanide vats in the district, with 9 in the village of Paningkaban itself. Most cyanide vats are positioned far from the mining activities, and are scattered around six sub-districts in all, making for a widespread tailings contamination problem.

7.2. Action Research for Central Java Site

YTS visited Paningkaban in June 2015, to conduct further processing to obtain mercury-free samples of concentrate for experimental testing. This was undertaken to determine if the concentrate could be upgraded by flotation. The thirty kilograms of concentrate produced in Paningkaban were taken to a laboratory in Jakarta where they were homogenized and quartered into four representative samples. The samples were predominantly composed of galena, chalcopyrite, pyrite and silicates.

The gold content was measured by Atomic Absorption Spectrometer and was found to be 11.5ppm Au. Several lab-scale flotation tests were conducted with a variety of reagents until the most suitable reagent was found for the test material. Three comparative flotation tests were then conducted at different pH conditions using the selected reagent. These tests were highly successful at floating the gold and concentrating the sample material into a super-concentrate. The samples were tested with reagent at a pH of 5, 7, and 12 respectively. The best results were obtained at a pH of 12.

At pH 12, the sample was successfully upgraded from 11.5 ppm Au to 163.9 ppm Au, whereas the total volume of super-concentrate material produced by the flotation was reduced down to 6% of the original volume. At this level of concentration, precious metals could be extracted by smelting the super-concentrate, and further refined by treatment with nitric acid to produce a pure gold product.

This action research was valuable in that it proved that gravity concentration by flotation could be a suitable alternative for artisanal gold miners working with lead sulphide ores rich in galena.

7.3. East Java

The village of Kebonsari is in Pacitan district in East Java. It is primarily a farming village, but it has a small community mining (WPR) area. The local miner's cooperative requested permission to mine in 2011, and the district government issued them with a mining permit in 2013. As a result, artisanal mining is now legal within the WPR area.

Three hilltops are currently being exploited by the community: Pandan, Kendalisodo and Tumo. Kendalisodo and Tumo fall within a legal mining area (WPR) and the mining permit (IPR) is held by the local miner's cooperative (Kelompok Sari Kencana). Tumo is the most intensively exploited site, and there is a lot of waste rock available at surface that carries low grades of gold. Although most of the mining takes place underground, there is also some superficial digging going on at surface. Over the last five years, the local miners have been getting 10g Au per tonne as an average grade. The deposit in Kebonsari is a low-sulphidation epithermal deposit, and the total pyrite is very low. As part of our baseline study, our team panned samples of both oxidic and sulphidic ores in three locations. We observed free gold in all samples, without any accompanying pyrite or galena. As a result, we considered the gold in both types of ore to be very conducive to gravity separation.

The mineral deposit has been carefully studied over the years, and the district mining department recently performed a petrographic and geochemical analysis to determine the mineralogy and the gold content of the ore. They found that the geological type is dominantly that of a breccia with quartz-kaolin veins showing argillic alteration and containing haematite. There are a few outcrops showing quartz veins, hydrothermal breccia, and lode with sylvanite – a mineral that contains high silver content as well as gold. Native gold is found in the quartz vein and other magmatic minerals as well as in lead-zinc veins that are less abundant. Most gold veins carry free gold, and the host rock also carries gold, but far less abundantly. The veins are mostly narrow and associated with faults and fractures. Alteration and weathering produces soft reddish clay and some kaolinite deposits.

During the baseline survey, we found an enterprising group of ten non-local miners operating a mercury-free process at the Tumo site. They were more organized than the local miners, and they were in the process of building a cyanide heap-leach plant. Their experimental gold recovery system was fairly capital-intensive as they were crushing ore in a large ball mill (without mercury) and treating the slurry with a nitric acid bath to dissolve the gold into solution. The pregnant solution was then filtered to recover a gold-rich precipitate that was then smelted in a coal furnace. The method was working well for them, but daily throughput was limited to the capacity of the nitric acid bath. We considered it would be suitable to introduce the Manado Method to them, so that they might only feed concentrates to the nitric acid bath, vastly increasing their overall processing capacity. Unfortunately, their operation was short-lived, and the site was abandoned by the time we returned in August.

All of the other miners in the village were found to recover their gold by whole ore amalgamation. Runoff was not contained, and much of the mercury-contaminated waste was seen to be flowing into the village drainage system. One miniature cyanide plant was found to be operating in the village; reprocessing the tailings waste from other households. The waste from that operation was also not properly contained. The district mining agency has yet to provide any assistance to the mining community such as safety training, or education about waste management or reclamation.

From July 5th to August 15th, the YTS team collected baseline information about mercury emissions, aspects of the ASGM economy, and data to establish the existing level of community awareness about the dangers of using mercury. By mid-August, all of the ASGM households had been interviewed as primary respondents. A secondary data set, primarily on health awareness, was also collected from women living near the contaminated processing areas. At the end of August, YTS also collected information about existing social channels in the village that could be utilized for the health campaign: visiting both the local health clinic in Gondosari, as well as the primary school in Kebonsari, to make preparations for future community awareness-raising events.

The YTS team collected baseline information by conducting individual interviews with ore-processors at their homes. A total of 87 primary respondents were interviewed, 56 male and 31 female. The team visited all of the mining households in the village with backyard ore-processing operations. If miners were not home, we gathered information from their wives - as they normally assist with processing. All respondents were from mining households that used mercury to process gold. In addition, the team interviewed one hundred women who were not from mining households and who did not use mercury. The hilly terrain, and considerable distances between miner's homes, as well as difficult road access, made it quite challenging to gather data from both the primary and secondary respondents.

The baseline data shows that the majority of miners have been active for less than five years (69%). Although ASGM activities began in 1997, most of those early miners were immigrants. Only a few locals from Kebonsari were involved at that time. However, these outsiders soon left again, as their high gold yields diminished by 2000. It was only in 2003 that some villagers from Kebonsari village actually started mining themselves. This was mainly in response to a long dry season during which

they could not farm. In 2011, twenty-seven miners formed a miner’s cooperative in order to request a community-mining permit from the district government. However, this was not done independently, rather it was done with the help of an external investor interested in obtaining a mining permit. As a result, a community mining area (WPR/IPR) was declared in 2013. At the time, there were only 25 mining households. Now, there are 85 mining households with a total of 270 tromols.

The majority of miners earn between one to three million rupiah per month from gold mining, and on average, each miner recovers approximately six grams of gold per month. As gold prices range from 400 - 450 thousand rupiah per gram, the value of six grams of gold is getting close to three million rupiah per month. Thus, during the dry season, gold production from the village is around 500g Au per month. However, it should be remembered that almost all of the local miners revert to farming during the rainy season. In addition, there are two cyanide operations that reprocess tailings. They are estimated to produce 200 - 300 grams of gold per month. The miners normally sell their gold to a gold shop in the neighboring village of Gondosari. Some also take gold directly to Pacitan where there are three gold shops: Mas Tanjung Pinang, Sinar Pahala and Kencana. Sometimes a mercury seller from Wonogiri also buys their gold. The data shows that on average, four to five family members are dependent on the income derived from mining as shown in the following table:

Number of Dependents	1-2	3-4	5-6	7+
Baseline Survey	7%	32%	55%	6%
Comparison Study	22%	51%	26%	-

Table 5: Number of family members dependent on income from ASGM

As part of our baseline survey, and again during our comparison study, we asked miners to estimate how much mercury they consumed per month. All of the miner’s estimates were in a similar range and we therefore believe they could accurately measure their rates of mercury usage and loss. The estimates showed that mercury loss per tromol ranged from 70 grams to 117 grams per month.

The price of mercury paid by the miners varied from Rp 600,000 per kg for high quality (imported) mercury to Rp 250,000 per kg for low quality (domestic) mercury. Most miners in Kebonsari were found to spend somewhere between Rp 197,000 to Rp 244,000 on mercury per month. Thus, we found that there is a fairly significant cost-saving to be gained from using a zero mercury process. Although small 100g parcels of mercury could be purchased in a local village store, most miners bought their mercury several kilograms at a time, from bulk suppliers. Three main suppliers were identified, coming from Pacitan, Surabaya, and Wonogiri respectively.

The baseline study showed that 72% of miners burned amalgam at home. Most of them said they did not use a retort. This was due to a general lack of availability of retorts, the small quantities of gold produced per miner, the negative perception that gold recovery is reduced by using a retort, and the extra time required. Some miners said they used crude retorts made from short lengths of iron pipe.

The baseline survey showed the rates of gold recovery and mercury loss to be quite typical of very small backyard processing operations. The Kebonsari site is therefore quite representative of many similar sites in Java where miners are processing low quality ores at home. For this reason, the project demonstrated a solution at this scale of operation. Remembering that the problem is widespread, the implication is that the same solution can be applied widely. Having defined the issue of scale, our field program aimed to tackle the problem of backyard processing of small quantities of ore.

7.4. Action Research for East Java Site

Action research for the Kebonsari site entailed conducting initial ore tests by gold panning to establish whether free gold could be recovered easily from the ore or not. This took place at several backyard processing sites, and the results were positive, both for oxidic and sulphidic ores. Following further testing at the demonstration centre, the team decided to carry samples of concentrate and free gold back to Palangkaraya where we could test them on a commercially-manufactured shaking table. In all, we carried three different ore samples of 2kg each, plus some additional fine gold dust that we had recovered. The equipment we used was the ‘Gold Wave’ table manufactured by Action Mining USA. This table is designed for fine gold recovery, and showed very good results on all samples of the Kebonsari ore. It was as a result of this testing that we decided to transport the table (on loan at no rental cost) to the East Java site, although this involved shipping it by ferry from Kalimantan. Having the table at the training centre proved to be a tremendous asset and an attractive training feature.

7.5. Discussion

Although it is a great mistake to put mercury into a grinding drum, whole ore amalgamation is widely practiced throughout Indonesia. This practice brings all of the ore into contact with mercury. The function of the mercury is to capture and concentrate gold particles within the liquid mercury droplets. As mercury is a high-density liquid, it can easily be separated from the slurry, carrying the gold within it. Miners are very accustomed to this practice, possibly because it is the only method they know. Alternative processes must therefore seek to replace the function of mercury. This means that the gold particles must be concentrated in another fashion. To achieve this aim, mining households must be shown that they can recover more gold from their ore by implementing some additional processing steps. As additional time and effort is required, the financial rewards must be higher, in order to capture their interest. Nonetheless, it seems very possible to introduce better processing methods to the artisanal gold miners of Java. For one thing, miners spend far too much of their time and effort digging for ore, and not enough time and effort on recovering their gold to get the full value of their ore. Miners need to understand that mercury is highly inefficient at recovering gold and that they are losing out to the tailings merchants. They need to be shown that there are better alternatives to working with mercury. Better processing methods can also serve to expand the mineral resource base available to the miners, as more of the low-grade material can be selected for processing.

As evidenced by the study of these two sites, we can see that miners in Java usually process their ore at home, without incurring any labour costs. When using mercury, the low labour requirements are considered advantageous, but in truth, miners often lose as much as half of the available gold as a result of spending insufficient time and effort on processing. As most miners choose to process their own ore individually, the first intervention required must be to educate them not to put mercury into the grinding drums. Clearly, miners must move away from the practice of whole ore amalgamation, and move towards the amalgamation of concentrates, or preferably straight to a zero-mercury process such as the panning of concentrates followed by direct smelting.

As most miners in Java choose to process their ore individually, gravity is probably the only process that they can use for primary recovery of gold as an alternative to mercury. Hence, the first stage of treatment after mercury-free milling must be gravity concentration. The purpose of this treatment is to separate the economic minerals from the bulk of the ore. If the gravity concentration method is efficient, the vast majority of the tailings may require no further processing. This waste can be safely disposed of, or used for building materials, as it is not contaminated waste. Another major advantage is that only the heavy mineral concentrate requires any further processing. This can be concentrated

again to become a super-concentrate. However, the more effort that is made to concentrate the ore, the more gold that may be lost to the tailings. Therefore, an economic balance needs to be achieved.

8. Establishment of Mercury-Free Facility

8.1. Demonstration Site

During our initial survey of backyard processing sites in Kebonsari, the YTS team also searched for a suitable location for the project's demonstration and training center. Fortunately, we were able to find a good demonstration site next to the main village road, giving the project good visibility. The site already had a roofed structure to cover the grinding station, and there was enough space for free circulation of the participants during training sessions. There was also ample space to add a containment pond for the tailings, and a panning pond for the concentrates.

During the months of August and September, the team worked hard to get the facility up and running as the first zero-mercury operation in the village. As the site had functioned as a milling station in the past, it was relatively easy to refurbish it at low cost and get it operational. YTS agreed to rent the site from the landowner on a monthly basis, thus keeping the establishment costs to a minimum. This allowed us to spend more money on providing training, and holding more demonstrations overall.

8.2. Scale of Operation

In Java, whole ore amalgamation typically takes place at home. In Kebonsari, most of the mining households process one or two sacks of ore per day in their backyards. The facility that we established was very representative of this scale of operation. Our intention was to demonstrate a zero-mercury process that would use the same basic equipment as the miners currently possess. It was also intended to operate at the same scale as the existing backyard operations. Thus, our site was only equipped with four drums, with a total grinding capacity of 60kg of ore per day. This was considered sufficient for demonstration purposes. The improvements we made to the existing site reflect what other miners must do in order to switch over to a non-mercury process. The starting point is to:

- a. clean the grinding drums and surrounding area of residual mercury
- b. build wooden sluices and obtain carpet and/or *ijuk* material for them
- c. establish a panning pond for the concentrates and obtain a goldpan

Thus, the facility intended to show the miners that they could stop using mercury by making a few simple improvements to their site, and some small adjustments to their processing methods.

8.3. Ore Quality

The deposit in Kebonsari is a low-sulphidation epithermal deposit, and the total pyrite is very low. The oxidized ore near surface proved easy to separate, and the ore from deeper in the tunnel was also low in sulphides. The gold appears in the pan as free gold, not occluded with other minerals, thus physical separation is relatively easy to achieve. The site is therefore good for gravity methods.

However, the majority of the ore brought back to the village is low-grade ore. Sometimes the ore may be even be uneconomical to process, but may still be processed in the hope of gold. As miners do not pay for their own labour they can afford to speculate with low-grade ores in the hope of finding gold. There is always an abundant supply of low-grade material that may or may not contain gold.

The majority of the ore processed in Kebonsari contains around 0.3g of Au per sack. As a sack of ore weighs around 30kg, the majority of the ore only contains around 10g of gold per metric tonne. There are times when miners will encounter good vein material with much higher grades, but that is the exception rather than the rule. Miners tend not to advertise when they have this material. Perhaps for this reason, all of the ore provided to the facility by the miners was always very low-grade ore.

8.4. Grinding

At first, the low grade of the material, coupled with the extremely fine grain size, worried the team. The first sacks of ore we processed yielded almost no gold and we were afraid we might be losing it. As a result, we worked with large volumes of concentrate rather than minimizing the volume as we wanted to do. Nonetheless, some gold was being lost, both from the sluice and from the gold pan.

We then experimented with reducing the grinding time from the usual eight hours down to five hours, thinking to speed the process up, and possibly improve the concentration by having larger grain sizes. This proved to be the wrong path however, and we then extended the grinding time to ten hours in order to liberate the gold more fully and get the slurry as fine as possible. We eventually concluded that the optimal grinding time was twelve hours, both to fully liberate the gold, as well as to create an even distribution of finely ground particles in the slurry. Unfortunately, by comparison, the average grinding time used by miners in the village is eight hours; and this can usually be reduced to five hours per run, by using the '*colokan*' system.

The '*colokan*' system is a common processing practice in which most of the slurry is washed out of the grinding drum using a hose so that the drum can be refilled with fresh ore. The mercury and heavy minerals remain at the bottom of the drum while the lighter clay materials are washed out. Small quantities of additional mercury may be added when refilling the drum if there is an expectation of good gold recovery. By doing so, miners are storing the heavy minerals in the drum and regrinding them, extending the overall grinding time applied to the material that goes in during the first run. Evidently, ore that is added for the second run will be ground for less time than the ore added for the first run. There is often also a third run, with further material added. This shows that the '*colokan*' system is not systematic, and results in a wide variance in the grinding time applied to the ore.

8.5. Sluicing

During the operational months of September, October, and November, we were able to gradually refine our concentration methods, and our demonstrations became increasingly successful. The major challenge we had to overcome was how to capture the floating gold. At first, we lay the sluices beneath the grinding drums so that the slurry could be emptied into them directly. However, this meant that the sluices only had a very slight angle of inclination. As the sluices lay almost flat, we had to use large volumes of water in an effort to float the clays out. But we soon learned that we were losing some floating gold by doing so. We then improved the sluices by getting thicker *ijuk* fibre mats and by overlaying these on top of open weave plastic carpet. But it wasn't until we raised the sluices dramatically that we were able to improve the concentration factor and overcome the loss of gold from the sluices. Miners learning to pan for the first time can also lose floating gold very easily, although this can be overcome with practice. Nonetheless, some miners are reluctant to learn to pan. For this reason, we decided to also demonstrate the use of a blue bowl as well as a shaking table, to provide some other alternatives for finishing the gold.

8.6. Gold Panning

At first, the team produced many kilograms of concentrate per sack of ore, and subsequently, the panning took much too long. Once we raised our sluices to the maximum height possible we got a much better concentration ratio: only one kilogram of concentrate produced for each thirty kilograms of ore processed (30kg = 2 drums). This reduced the panning time to only fifteen minutes per sack of ore. This was much more acceptable to the miners. The major obstacle to adoption is panning time because it is laborious. The less time that is required the more acceptable it becomes to the miners.

The simple use of a gold pan (and a magnet to remove the magnetic minerals and iron) can result in far better gold separation than by using much of the sophisticated and expensive equipment available today. However, most miners disregard panning as an alternative to mercury. This is because they have grown accustomed to a less labour-intensive method. This reality is unfortunate, because the additional effort of gold panning can be highly rewarding. Most miners spend a great deal of effort on excavating their ore, and far too little on realizing the full value of their ore when processing it. This simple equation needs to be rebalanced. Miners must change their behaviour and expect to spend more time processing their ore in order to maximize gold recovery.

For many types of ore, especially those in an oxidized state, the art of gold panning can easily replace mercury use outright. It can also be performed at the backyard scale. As most miners in Java only own and operate between one to four grinding drums in their backyard, they are only processing 10-40kg of ore at any one time. This means that they could easily pan all of the material directly if they wished to. However, if small sluices are used to process the slurry after grinding, only the concentrate needs to be panned. Thus, from a technical perspective, gold panning is a feasible alternative to WOA.

Training and equipment can be provided to up-skill miners to become proficient gold panners and to extract more value from their ore than by using mercury. In the case of ores that contain an abundance of free gold, gravity separation methods will certainly give much better results than mercury.

8.7. Finishing

The project demonstrated three methods of super-concentration:

- Blue Bowl – better suited to capturing gold particles sized above 100 microns
- Panning – finishing is excellent, with free gold particles and very little gangue minerals
- Shaking Table – a fast and effective way to finish large quantities of concentrate quickly

All three were effective but to varying degrees. The best results were obtained by gold panning. By careful panning it was possible to obtain concentrate that consisted primarily of gold particles. In the case of the shaking table, it was true that gold particles came to the fore, but it was difficult to retrieve them without taking up a good deal of gangue material in the process. The blue bowl was the least effective technology, as it was not at all possible to achieve separation of the extremely fine gold.

8.8. Direct Smelting

Direct Smelting is a method of obtaining finished gold from super-concentrates without the use of mercury. This is commonly assisted by the use of Borax as a flux. In a gold crucible, a flux functions to absorb impurities, so that the molten gold can coalesce into a gold pellet. Direct smelting can only be performed on finished super-concentrates that contain a high percentage of gold (10% - 50%). The project demonstrated this zero-mercury method to the point where local miners were able to perform the technique unsupervised. However, this was not without its challenges. Our initial demonstrations were unsuccessful as we failed to achieve this high level of gold concentration. However, the direct smelting demonstrations became increasingly successful over time, as we made gradual refinements to the sluicing process, thereby reducing the overall amount of concentrate produced. The other major challenge that presented itself from the outset was the extremely low gold recovery from the low quality ore supplied to us. Thus, our initial attempts at direct smelting were unsuccessful both because there was far too much silica in the initial concentrates we produced, and because there was far too little gold, due to the very small quantities of gold available from each day's production.

9. Demonstrations & Training

9.1. Purpose of Demonstration and Training Events

Miner training in zero-mercury techniques took place over the course of forty demonstration days held during September, October and November 2015. During this time, almost all of the miners in the village participated in the training events at our facility.

The purpose of these events was to expose the entire mining community to new knowledge regarding how to process their ore without mercury, and provided an opportunity to gain hands-on experience with new technologies and techniques. Furthermore, the training events provided a good opportunity for miners to learn that mercury is an occupational hazard, and an inefficient means of gold recovery.

Having the zero-mercury facility operational in Kebonsari ensured that the project was grounded in the reality of the ordinary ASGM environment. This to ensure that the policy work in Jakarta would be informed by the everyday realities and challenges faced by the ASGM communities. Likewise, the training events did not occur in isolation from national government interest and oversight.

9.2. September

The equipment provided at the facility was rudimentary, but designed to be effective in the hands of well-trained operators. As the facility was operational by the end of August, training-of trainers began at the start of September. Three local miners were selected to become the operators of the facility, and empowered to act as trainers to other miners visiting the facility. One of our operators was the head of the miner's cooperative and he was also put in charge of procuring ore for the project.

In addition to learning how to pan efficiently, the team of local miners also had to learn new skills with regard to grinding, sluicing, classification, and direct smelting. This was done on a participatory basis, learning by doing. We began grinding ore at the facility on August 30th. The pattern was to grind two sacks of ore each night, to be ready for demonstrations the following day.

As stated earlier, the facility was deliberately scaled to match the individual processing requirements of the miners in the village. Processing two sacks of ore per night is representative of the activities of most of the artisanal gold miners operating in Java. In our opinion, the demonstrations needed to be performed in the most accessible manner possible for the miners. For this reason, it was considered neither necessary nor sensible to demonstrate techniques or technologies that the miners could not implement immediately when acting independently.

Grinding: there was a gradual process of trial and error involved at first, and through experimentation, we found it was better to grind the rock for several hours longer than is commonly practiced in the village. After seven hours of grinding, the slurry was usually still slightly sandy, but after ten hours, all of the sand-sized particles were gone. It was still possible to pan even though it was very fine clay. We then extended the grinding further, up to a maximum of twelve hours.

Sluicing: we wanted to have a simplified sluicing process, whereby the slurry in the grinding drums could be emptied directly into the sluices to save on time and labour. However, having the sluices on a relatively flat bed meant that we needed lots of water to wash the slurry through them. This was a major disadvantage, as it gave more opportunity for the gold to be floated off the sluice.

Classification: to classify the concentrates produced by the sluice, we used a 100-mesh sieve (149 microns) to sort the material before using it on the shaking table and for the blue bowl tests. It was unnecessary to classify the material prior to panning. All of the gold was found to be far finer than this mesh size, and most gold grains seemed to be around 100 microns in size. However, the use of

classifying sieves was found to be a necessary precursor to the use of the shaking table. This method does of course imply that miners can get access to geological sieves as well as a shaking table.

Direct Smelting: to obtain finished gold from super-concentrates without resorting to amalgamation, we conducted direct smelting of the gold, assisted by the application of Borax as a flux. In a gold crucible, a flux functions to absorb impurities, so the molten gold can coalesce into a gold pellet. We felt it important to show a complete zero-mercury process, from start to finish, as miners want to see gold at the end of the process. However, gold recovery was usually only around 0.2g Au per day due to the very low quality of the ore provided by the local miners. This amount is insufficient for direct smelting. Therefore, we usually held the recovered gold over for a few days and allowed it to build up in quantity before demonstrating direct smelting.

During September, gold was still appearing in the tailings, so it was apparent that we were losing gold from the sluice. We were also worried about losing gold from the panning process as gold was also appearing in the panning tailings. This was not surprising given the large amounts of material we had to pan. We realised that the gold was literally floating away. The water was carrying it off.

We then decided to thicken the matting on the sluice by overlaying the *ijuk* material over open-weave plastic carpets. This was a good idea, as it further reduced the volume of the concentrate produced.

9.3. October

Initial demonstrations from the start of October were limited to a small group of participants, as we continued to face problems with our gold recovery. Before we could conduct our demonstrations, we had to achieve a better understanding of how to deal with the characteristics of the gold at Kebonsari. For this reason, it was fortunate that on the 4th October, we had a site visit from Dr Kevin Telmer of the Artisanal Gold Council. Dr Telmer made an important recommendation for improvements to the sluice performance. The team immediately implemented his advice, and the overall concentration process improved greatly as result. The main recommendation made by Dr Telmer was to pitch the sluice as steeply as possible to allow most of the material to run off immediately, leaving as little material behind as possible, and then lower it very slightly to capture only gold concentrate.

We therefore raised the receiving end of the sluice by one metre, so that it was pitched quite steeply, considering the sluice was only three and a half metres long. Pitched at this angle, we no longer lost gold, and we greatly reduced the amount of concentrate retained by the sluice. After having modified the sluices and elevated them, we were able to achieve a concentration ratio of 1:30.

Thus, the loss of floating gold was overcome by raising the sluices. After this, extremely little gold was lost, and only a few gold grains were detected from a bulk sample taken from the sump. After making these changes, the demonstrations could be conducted successfully, especially as the amount of concentrate produced per sack was reduced down to only one or two kilograms, and that reduced the panning time down to only ten minutes per kilogram of concentrate produced.

It was difficult to compare our gold recovery by gravity methods with the miner's ordinary level of gold recovery by mercury amalgamation, as there is no standard that can be applied, and individual ore samples will vary enormously in gold content. Therefore, the method we chose to compare our results against recovery by mercury was to amalgamate our tailings to check for residual gold.

To prove that we were not losing gold from the panning process, we took all of the concentrate that had accumulated in the panning pond from 6th-14th October, and reprocessed it to see what gold we might recover. To prove that we were not losing gold that might otherwise have been recovered by mercury, we reprocessed all of the material using standard whole ore amalgamation practices. This was done at a neighboring mill so as not to contaminate our facility. The amalgamation tests of our

tailings proved that we were not losing gold that may otherwise have been obtained by mercury. The results were as follows:

Processing Period	6 – 14 October
Amount of ore processed	22 sacks / 500kg
Gold recovered by panning	1.0g Au
Gold recovered by WOA	none

Table 6: Results from Panning Pond

Having conducted these tests with the tailings, we were satisfied that the low level of gold recovery we were experiencing was due to the poor quality of the ore that was consistently supplied by the local miners to the project rather than due to a problem with our processing skills.

Further ore processing was conducted from 13-15 October, with another ore, supposedly of better quality. The grade of this ore was expected to be around 10g per tonne: fairly typical of the majority of the ore processed in the village. We bought four sacks of crushed ore for Rp.150,000 per sack and hoped to recover at least one gram of gold from these sacks. We milled two sacks (60kg) for seven hours then emptied them into the sluices. We collected 2kg of concentrate from this 60kg of crushed rock. We did the same the following day for a total of 4kg of concentrate from 120kg of ore. We panned all of the concentrate carefully, and recovered 1.0g of gold.

At the end of October, we decided to add another layer of technology to the site, as the community had stated that they had hoped to see more sophisticated gold processing technology in use at the facility. Thus, a Gold Wave shaking table (M8) was transported to the site and set up alongside the tailings pond. The unit was loaned to the project, so the only cost was for transportation to and from the site. A shaking table provides an excellent way for miners to see their gold up close, allowing them to understand the grain-size distribution and other characteristics. This is not possible when working with mercury. The purpose of having the table on site was to demonstrate a higher level of technological sophistication and get over the perception that we were not offering anything of value.

9.4. November

The November mission (6th-30th) was a concerted effort to get more miners to visit the facility and attend trainings. Thus, YTS issued personalized letters of invitation to all of the miners in the village, staggering the invitation dates so as to ensure that only a very small group would attend each day. Participants were quite enthusiastic in general, often providing their own advice to the trainers.

There were a total of twenty demonstration days held in November. The project processed 1,125kg of ore (38 sacks) over this period. There were 18 trainings held with small groups of miners, during which time, a total of 74 miners were trained in our zero-mercury methods. Thus, most of the miners in the village attended these training events. The miners learned how to use the sluices to make high-quality concentrate, and how to finish the concentrate: either by gold pan or by shaking table. The miners had ample opportunity to discuss the techniques and benefits. YTS also used the opportunity of having small groups of miners attend the facility to show a video on Minamata Disease, and to talk about health impacts from mercury. This small group method was quite effective. The miners wanted to know why mercury is dangerous and we were able to answer their individual questions.

The shaking table was demonstrated in the month of November as an additional feature of the facility. It was not a requirement for successful operation of the facility and it was removed at the end of the month, having served its purpose as a demonstration tool. When told the cost of the unit, the miners

considered it unnecessary to own, and preferred to practice panning instead. Some were curious as to whether they could build their own tables.

The table provided excellent separation from the silicates and sulphides. The gold emerged ahead of the heavy minerals, however there was still some overlap between the two. Therefore, to recover all of the gold, it was necessary to collect gold that remained mixed with the heavy minerals. This was not yet suitable for smelting. When using a gold pan however, we were able to smelt the gold directly. One of the reasons why our panner was more successful at finishing the gold than the table, was that his pan had a capture-point at its centre that withheld only the fine gold within the depression. Thus, we found that the action of a shaking table is not as sophisticated as the action of a gold pan, although it does allow for larger quantities of concentrate to be processed in a shorter time.

For viewing purposes, the table was very good, and miners could easily see the differences between the gold grains and the pyrite, as they were well separated. They could also study the grains up-close with a geological hand lens (x15). The miners were very interested in how to work the shaking table. However, they thought the unit was very expensive and this made them look at panning more closely as a viable alternative. Thus, it was important for the project to demonstrate both the manual method and the machine. By comparing the results from the shaking table with the results from the gold pan, we were able to show that the human hand and eye can be more skilful than a machine.

In addition to being used successfully as a demonstration tool, the table was also useful for processing bulk samples of tailings to check if any gold had been lost by the operation. This proved not to be the case. Having the shaking table on-site provided us with an opportunity to test the material in the large tailings pond, to see if gold was being lost from the sluices. Two bulk tests were performed, of 30kg each, with material taken from different points. Only a very few grains of gold were discovered, meaning that our losses were fairly insignificant. This proved that the sluicing was effective. We had already tested the concentrate from the panning pond and also found no gold, meaning the panning was also effective. Remembering that mercury usually only captures a maximum of 60% of the available gold from an ore, it seems sure that the gravity process is more effective.

9.5. Feedback from Miners

The team took note of some direct feedback from miners on the zero-mercury process, as follows:

- many participants stated that if the district government were to ban the use of mercury then they would revert to using our zero-mercury method
- some participants stated that if they were not allowed to use mercury then they would simply stop mining altogether
- some participants felt our alternative process was too time-consuming

Some specific feedback on the shaking table was also noted, as follows:

- most miners considered the table to be too expensive and thought it would therefore be more sensible just to use the gold pan
- some participants considered it might be possible to make their own version of the table

10. Health Awareness Campaign

10.1. Campaign Delivery

The health awareness campaign took place over the months of October and November. It was aimed at raising the awareness of the mining community in particular, but also targeted women and children in the general community. The campaign approached three different target audiences separately: male miners, women affected by mercury, and children. The communication strategy was to conduct house-to-house visits with miners, but the team also visited schools and the local health clinic to reach out to women and children.

In October, our messaging reached 112 households, and our team spoke at length with 88 women and 24 men directly. All of these people were from our primary and secondary target groups. The health awareness campaign was also performed by holding information sessions with women's groups and by distributing media.

In November, the campaign delivered health messages to 165 children in 3 schools, plus 125 women from local women's groups. Close attention was also paid to the 73 miners that attended the training events, as this provided an opportunity to show video material on Minamata Disease and to discuss negative health impacts on mercury users, in order to raise their level of awareness and concern. Each day, we received about four miners in a small group at the facility. This small group method was quite effective. The miners wanted to know why mercury is dangerous, and we were able to answer individual questions. Miner's general knowledge about the hazards of mercury increased. According to respondents, they had received no previous information about the dangers of mercury.

Community support was demonstrated by having the various target groups make banners displaying their handprints in support. The banners were later displayed at our concluding workshop in Jakarta. The miners of the village did one banner, women another, and children a third. Altogether 313 people showed their support for the project by putting their handprint on a banner.

During the campaign, YTS gave out brochures, stickers and height charts, and talked directly with men, women and children. We also gave away project T-shirts as rewards to people who participated actively. The campaign media was delivered as shown in the table below:

Campaign	Months	Stickers	Height Charts	Brochures	T-Shirts
October		50	22	86	4
November		376	77	288	26

Table 7: Campaign Media Delivered to Target Groups

10.2. Baseline Comparison Study

In November, the team conducted a comparison study using the same interview sheets as during the baseline study. Post-project data collection from 74 miners and 126 women, found that there was a good overall increase in community awareness regarding exposure to mercury:

- Whereas only 64% of respondents thought mercury to be dangerous during the baseline survey, the comparison study found that 92% of respondents agreed that it was dangerous.
- Whereas 92% of respondents stated that they were not exposed to mercury during the baseline study, by the time of the comparison study, this figure had dropped to 61%, with 29% now stating that they were exposed to mercury and 10% choosing not to answer. Those who agreed now believed they were exposed by skin contact when doing amalgamation but did not mention any exposure from burning amalgam.

- 71% of the respondents who said that mercury could harm children now also knew that mercury could cause damage to the kidneys, respiratory system, brain and nervous system. In addition, they said that mercury was dangerous if swallowed. Only 29% of respondents could not give any reasons why mercury was harmful.

10.3. Increased Health Awareness Among Men

The comparison study (November 10th – 28th) gathered data from 73 male respondents. All of them were miners that had been involved in the demonstration and training sessions. The main outcome was that miners now understood that they were exposed to mercury, both by direct skin contact when conducting amalgamation, as well as by inhalation during amalgam burning. The number of miners who believed they were exposed to mercury increased from 7% to 50%.

Furthermore, during the baseline study, only 20% of miners were aware that methods other than mercury and cyanide could be used to obtain gold. Our comparison study showed that 82% of miners were aware of mercury-free alternatives by the end of the project. As a result of attending training, they had learned that they could also recover gold by sluicing and panning, or by using a shaking table. Thus, knowledge about the existence of mercury-free alternatives increased from 19% to 82%.

10.4. Increased Health Awareness Among Women

The baseline survey for women with a high risk of exposure to mercury (July 6th- October 21st) involved 100 female respondents. The comparison study involved 126 female respondents. These comparative surveys aimed to get us a better understanding about the role of women in processing ore, and their level of awareness about the health impacts of mercury use. We found women to be highly involved in the crushing and milling of ore, but the results of the baseline and comparison study showed that only 5% of women handled mercury and burned amalgam.

During the baseline survey, 58% of female respondents agreed that mercury was harmful to human health but did not know what the dangers were. Only 15% of female respondents answered that mercury was harmless. Regarding their own exposure to mercury, 72% believed that they were not exposed to mercury, 24% of them said that they did not know if they were exposed to mercury, and 4% said that they were exposed to mercury. In the comparison study, the number of women who said that mercury is dangerous rose from 58% to 94%. Their awareness about their exposure to mercury also increased from 4% to 29%. Lastly, the number of respondents who admitted that they kept mercury in their house also increased from 26% to 32%.

The baseline survey showed that 62% of respondents agreed that mercury could harm their children. However, they could not explain what kind of impact might occur. In the comparison study, 92% of respondents agreed that mercury could harm their children, and they could clearly state the health impacts of mercury poisoning. Thus, the number of women who understood that mercury could harm their children increased from 62% in the baseline study, to 92% in the comparison study.

The comparison study therefore showed that a general increase in awareness about the health impacts of mercury had taken place. By the end of the campaign, 94% of female respondents knew mercury to be dangerous and could mention several of the major symptoms caused by mercury poisoning.

These increases in awareness can be attributed to the success of the project's community health campaign, which ran in Kebonsari village from August to November 2015.

11. Final Stakeholder Consultations

11.1. Ministry of Environment & Forestry

In addition to making preparations for the concluding workshop, the project provided support to the Government of Indonesia by recommending policy revisions to existing regulations for ASGM. Under coordination of the Directorate General for Control of Environmental Pollution and Degradation, a series of stakeholders meetings on policy revisions were held from 15 October to 17 November 2015. A draft revision of the existing regulation was discussed. Some important policy revisions suggested in the draft included:

- Adding a new legal basis, by including Mining Law No. 4 Year 2009, Local Government Law No. 23 Year 2014, Village Law No. 6 Year 2014, and Forestry Law No. 41 Year 1999.
- Adjusting definitions to align with newly adopted regulations.
- Mitigating environmental damage from ASGM, and rehabilitating landscapes damaged by ASGM activities.
- Elaborating that environmental aspects be considered not only in determining locations for community mining areas (WPR/Wilayah Pertambangan Rakyat), but also in establishing requirements for obtaining gold mining and processing permits.
- Providing a clear guideline and simplified process for obtaining community-mining permits.
- Differentiating between gold processing and gold mining in the regulations.
- In accordance with the Minamata Convention and the NAP, the new draft clearly states that mercury may still be used, by using a retort and/or by taking other measures, but mercury use shall be phased out by 2018, by which time violations will be met by sanctions.
- Government – Central and Local – shall provide coaching and assistance to ASGM in the ASGM formalization process and make efforts towards environmental friendly ASGM.
- New articles are added to accommodate incentives and environmental recovery.

11.2. Coordinating Ministry of Economic Affairs

On December 17th, YTS attended a stakeholder meeting in Jakarta held by the Coordination Ministry for Economic Affairs. Three presentations were made, followed by a focus group discussion regarding suggestions for new policy on formalization of the ASGM sector. There were 57 participants from various different sectors: namely eight government ministries, plus representatives of the Mining & Energy agencies from the provincial level, the Indonesian Mining Institute (IMI), the Indonesian Mining Association (IMA), as well as representatives from several of the larger gold miners i.e. Newmont, Freeport Indonesia, Sorikmas Mining, and ANTAM. It was a privilege for YTS and Blacksmith to be allowed to attend, as we were the only NGO's to be invited by the ministry.

Three presentations were in the meeting, entitled:

1. 'The Current Condition of Informal Mining and Countermeasures for Control' by the Ministry of Energy and Mineral Resources,
2. 'Effective Steps for Mitigation of Informal Mining' by the Indonesian Mining Institute
3. 'Zero Mercury and Cyanide Technology in ASGM' by Andrew Neale from Demaro Technology Indonesia.

A further series of follow-up meetings was suggested as part of the action plan from the discussion, particularly in relation to planning prospective projects on ASGM and involving more stakeholders.

12. Concluding Workshop

12.1. Workshop Delivery

The concluding workshop took place on the 30th November 2015 as a full day event. The purpose of the workshop was to create a forum for discussion between relevant ministries. Conceived of as an opportunity for further policy dialogue as well as an opportunity to report on project implementation in the field, it was once again a multi-stakeholder event, hosted by MOEF.

The content of the workshop recognised the importance of discussing how to mainstream zero-mercury techniques (mainly gravity techniques); the formalization of ASGM communities; and the need to support sub-national governments and provide funding. Also, the urgent need to harmonize the NAP with Annex C of the Minamata convention. The MOEF stated that they intend to perform an overall evaluation of the implementation of the National Action Plan during 2015. Thus, the closing workshop provided an important opportunity to influence the thinking of the national government.

Once again, this project provided a technical presentation by YTS and a policy presentation by the Blacksmith Institute. The YTS presentation explained some of the requirements for a successful demonstration project, and the challenges that may be faced. It showed how the YTS fieldwork in Kebonsari brought together some of the necessary factors for success: such as having ore suitable for processing with gravity and the appropriate legal framework in place. It also showed how a non-mercury process could be applied to the ore, and how the project resulted in the training of 74 miners and 3 local experts, as well as the education of 609 people regarding mercury hazards.

These presentations were followed by a presentation on the revision of the ministerial decree 23/2008. There were three main points: (a) the content of the regulation, (b) the text in the regulation, (c) the content of six meetings held by central government ministries on: licensing for personnel; banning processing locations in residential areas; and clarifying responsibility for recovery and remediation.

The next presentation covered eleven activities in the NAP including: supervision and monitoring; legal framework components; technical guidelines for prevention; land allocations for mining; potential funding sources; awareness raising; incentives; and law enforcement.

12.2. Presentation Points

A summary of the main points derived from all of the workshop presentations is as follows:

- Sumali Agrawal from Yayasan Tambuhak Sinta presented a project progress report regarding the zero-mercury technology training in Pacitan District.
- Masnellyarti Hilman and Budi Susilorini from the Blacksmith Institute presented a project progress report regarding the revision of the proposed draft regulation of Ministry of Environment No. 23 Year 2008 and the harmonization of the NAP with Annex C of the Minamata Convention.
- Ibu Lana from the Ministry of Energy and Mineral Resources presented the main points addressed by the NAP implementation over the last two years, which has focused on three aspects: research and development, strengthening of legal aspects, and the involvement of 12 relevant ministries. MoEMR is working in collaboration with BPPT in research on technologies to be used in pilot projects in Banyumas, Lebak, West Sumbawa and Central Java. On the legal aspects, they have issued two regional regulations concerning the prevention and control of mercury use. The cooperation with the various ministries involved in the communication forum has focused on raising awareness in ASGM communities. They have also disseminated information on the dangers of mercury in gold processing, and will introduce new technology in Ambon (Buru Island), Wonogiri and Pacitan. There will be a follow-up program in those areas.

- Ibu Sulistyowati from the Ministry of Environment and Forestry presented a database on open-access lands gathered during the period 2010 to 2014, involving 302 ASM locations in 29 provinces (DKI Jakarta and Central Kalimantan were not included). An inventory was performed that covered four aspects: (1) environmental damage, (2) ongoing and past conflicts, (3) the wellbeing of community miners, including women and children, (4) the commitment of local government. There are 92 districts (*Kabupaten*) with WPR areas, but only 9 have been legally formalized. ASM locations are dominated by gold mining, of which 202 are informal ASGM and only 44 locations have some form of mining permit (IUP/IPR).
- The Ministry of Health presented their own NAP development on controlling the threat that mercury poses to human health, in relation to the implementation of the Minamata Convention and the goal of mercury elimination in ASGM. Six points were presented: the legal framework to control the risks from mercury, standardization of data, exposure control, strengthening institutions and health-workers, education and socialization to communities, and community development.
- Sarodjo from the Ministry of Small Enterprises and Cooperatives (KUKM) presented the policy concerning the empowerment of small-medium enterprises and cooperatives in the ASM sector; covering the vision and mission of KUKM, the legal framework, the actors of KUKM, the structure and the business units of KUKM. It clarified the main objective of KUKM in ASM: to support alternative activities for ASM actors and/or diversification of business and livelihood activities. If miners leave the ASGM business, KUKM will create diversified businesses other than mining (such as agriculture or fisheries) but this has to be in the form of cooperatives, it cannot be individually based. If miners continue mining, it has to be zero-mercury and under a cooperative structure. It has to be supported by a legal entity, and include an environmentally-friendly tailings management mechanism. Up until 2014, only Rp. 16 billion worth of KUKM program funds were invested in community mining, which is considered low.
- Gatot from the Indonesian ASM Association (APRI) presented a plan for the acceleration of mercury elimination in ASGM. He referred to the Minerba Law no.24/2009 as a basis for recognition of both formal and informal community mining, stating that responsible community mining would only be possible once legal issues are resolved. He also suggested some actions towards responsible mining, starting by recommending that all mining must be done collectively, meaning that groups have to be formed in the mining areas. He suggested that government needs to empower and educate miners, and introduce environmentally-friendly technology. The process of legal and technical education has to be done in parallel. He stated that APRI members have shown their good intention by declaring their commitment to be free from mercury by 2018, but will require a transition period. During this period, government was requested not to treat the informal miners as criminals, and to support them in this process of transition.

12.3. Closing Remarks

The Director for Management of Hazardous Waste closed the workshop by saying that it had achieved its major goals by presenting:

1. A success story in the form of the Kebonsari project
2. An effort to harmonise the existing NAP with Annex C of the Minamata Convention
3. Further commitments to eliminate mercury by 2018
4. Further commitments to the goal of formalization of ASGM

13. Conclusion

13.1. Context

In October 2013, Indonesia was one of 92 countries that signed the Minamata Convention on Mercury, which calls for new policy measures to address ASGM as part of an overall environmental governance strategy. Article 7 of the Convention stipulates that governments must develop National Action Plans that include measures to facilitate the “formalization or regulation” of the ASGM sector. Most of the ASGM sector in Indonesia is unlicensed or “informal” which limits efforts to promote cleaner technologies and strengthen environmental stewardship. Project activities were performed in accordance with the above policy measures, as well as with Indonesia’s National Action Plan on Controlling Mercury Use in ASGM, and the Ministry of Environment and Forestry’s mandate to control toxic substances and mitigate environmental pollution.

13.2. Technical Component

In terms of the technical focus of the project, the team was successful in demonstrating an alternative process to mercury, at an operational scale suitable for backyard processors in Java. Despite some initial difficulties faced in finding an appropriate site, the project successfully established a miner training and demonstration centre in a government-endorsed community mining area in the province of East Java. YTS continued working at this location for the remainder of the project duration. The project managed to establish a platform from which to achieve its major field-based objectives. In addition, the project made a set of technical recommendations regarding the Paningkaban site in Central Java, having concluded an investigation into the efficacy of flotation technology for that site.

In our opinion, the formula for successful ASGM interventions in Indonesia depends upon the creation of ‘appropriate technology’ centres that will assist miners to convert to zero-mercury processing. Facilities should be owned and operated by the community, and the shift towards cleaner processing methods should be supported by the enactment of village-level regulations to prevent mercury use and support the transition to a mercury-free future. Milling should be done using standard configurations found at most hard-rock processing sites in Indonesia. This equipment is manufactured in Java and can be procured easily, but more importantly, the miners will already be familiar with this method of operation, although the additional zero-mercury processing steps will be new to them. However, as long as government enforces no ban on backyard processing, the many thousands of miners in Java will likely continue to use mercury.

13.3. Policy Component

In terms of the capacity-building focus on governance, the team was successful in obtaining a high level of support at the national level, both from the Ministry of Environment and Forestry, as well as the Ministry of Energy and Mineral Resources, putting the project in a position of strength vis-à-vis making policy recommendations and convening power for the national workshops.

Annexes

Annex I:	Report on Inception Workshop
Annex II:	Report on Concluding Workshop
Annex III:	Project Logical Framework
Annex IV:	Photo Gallery
Annex V:	Site Maps

Annex I: Report on Inception Workshop

INCEPTION WORKSHOP

Jakarta, 1ST September 2015

A. Background

The United Nations Environment Programme (UNEP), in partnership with Yayasan Tambuhak Sinta (YTS), has launched a project to support the Government of Indonesia in the implementation of the National Action Plan for Mercury Phase Out in Artisanal and Small Scale Gold Mining in Indonesia through series of activities that include,

- Inception workshop, to raise stakeholders awareness about the project as well as to build network with the relevant stakeholders;
- To develop baseline estimate of mercury use in artisanal and small scale gold mining (ASGM) using a methodology that has been approved by all stakeholders;
- Technical intervention for appropriate and innovative mercury-free gold processing technique;
- Health campaign, to raise public awareness toward mercury hazard;
- Stakeholders consultation, especially with the relevant government institutions, to support the implementation of the National Action Plan (NAP); and
- Conclusion workshop, to present the project progress update through the project closure, incl. baseline estimate of mercury use in the pilot project site, the effectiveness of technical intervention and awareness campaign.

Blacksmith Institute, which has been appointed to be the project liaison to the Government of Indonesia, i.e. Ministry of Environment and Forestry (MOEF), was responsible to organize the inception workshop, and the task was carried out through the following activities,

- Coordination with MOEF and YTS, incl. communication with contacts in MOEF and preparing TOR;
- Logistic, incl. invitation distribution, venue preparation and seminar kit production based on material that had been designed by YTS and approved by MOEF; and
- Preparation of presentation in regards to public policy recommendations, as well as necessary follow up actions with MOEF.

B. Preparation

Ministry of Environment and Forestry has taken an important role not only as the main counterpart for the project, but also as the co-host of the inception workshop. Intensive coordination was conducted through a series of meetings,

1. Audience with the Director General for Management of Solid Wastes, Hazardous Wastes and Hazardous Substances on Friday, 26 June 2015

In the audience that was also attended by the Director for Management of Hazardous Substances, YTS and Blacksmith explained about the project and work plan as well as to inquire letter of support from MOEF. Additionally, the team provided time frame for the inception workshop which was scheduled at the first week of September 2015 and proposed for MOEF to be the co-host of the workshop.

2. Coordination Meeting on Monday, 10 August 2015, at the meeting room of Ministry of Environment and Forestry

Chaired by the Director for Management of Hazardous Substances, the meeting was attended by representatives from Ministry of Environment and Forestry, Ministry of Energy and Mineral Resources (MOEMR), Yayasan Tambuhak Sinta and Blacksmith Institute. Agenda of the meeting included discussion on the workshop terms of reference as provided by YTS and Blacksmith, and list of invitees to incorporate inputs from MOEF and MOEMR. Other topic concerning ASGM that was discussed in this meeting included our inquiry to MOEMR to respond to Local Government's inquiry, such as from Banyumas Regency, Province of Central Java, that requested further technical assistance to shift completely from mercury, and MOEF to evaluate the implementation of NAP.

After the coordination meeting, Blacksmith conducted an impromptu visit to the office of Director General for Management of Solid Wastes, Hazardous Wastes and Substances for discussing Used Lead Acid Battery (ULAB) Project. Additionally, in the same occasion, Blacksmith also reported the result from the coordination meeting and submitted a verbal inquiry to the Director General to deliver a remarks and officially open the workshop that had been set on Tuesday, 1 September 2015.

3. Final Coordination Meeting on Monday, 31 August 2015, at the meeting room of Ministry of Environment and Forestry

The meeting was chaired by the Director for Management of Hazardous Substances and attended by Drs. Hoetomo, MPA, as the appointed moderator for the discussions; Ibu Halimah Syafrul, Expert Staff to the Minister of Environment and Forestry, as the appointed main discussant from MOEF; Yayasan Tambuhak Sinta and Blacksmith Institute.

In this meeting, the team discussed the run down in detail and came up with a few adjustments to finalize the agenda. During the discussion, a need to blow up the issue of mercury use in ASGM through media was seriously raised, so the team agreed to organize a media briefing with the Director General for Management of Solid Waste, Hazardous Wastes and Hazardous Substances to be the key speaker, and to prepare a press release.

Led by the Director for Management of Hazardous Substances, a small team that consisted of Blacksmith and Drs. Hoetomo, MPA, met the Director General for Management of Solid Waste, Hazardous Wastes and Hazardous Substances to report the preparation, incl. agenda for the Director General's opening remarks and media briefing after the opening.

C. The Inception Workshop

The inception workshop was held in Kalpataru Room, Ministry of Environment of Forestry, Building B, 2nd Floor, Jl. D.I. Panjaitan Kav. 24, Kebon Nanas, Jakarta Timur, with participants amounted to approximately 70 people whom represented the relevant government institutions, local government, foreign government, international institutions, university and NGOs.

In his foreword, Kenneth Davis, Programme Officer from UNEP, stated that ASGM is the number three biggest contributor of mercury emission in Indonesia as reported in UNEP's Global Mercury Assessment in 2013. As Indonesia has an important role in the implementation of the Minamata Convention, the project that is launched by UNEP and YTS to promote appropriate and environmentally sound technology in East Java could be adopted as a practical solution for ASGM.

The inception workshop was officially opened by the Director General for Management of Solid Wastes, Hazardous Wastes and Hazardous Substances, whose remarks pointed out the commitment of the Government of Indonesia in ASGM sector, incl. MOEMR that has developed Minerba One Map of Indonesia (MOMI) to regulate land use also for the community mining area. Then, MOEF has an obligation to coach and provide alternative environmentally sound technologies. As a follow up to the Minamata Convention which the Government of Indonesia has also signed, the Government has several programs, incl. strengthening legal framework, ratification of the Minamata Convention, developing a national action plan for mercury reduction and development of environmental friendly technologies.

The essence of the workshop was in the discussion which was separated into two sessions with Drs. Hoetomo, MPA, as the moderator for both sessions. While the speakers and topics were as follow,

- Session 1
 1. "Mercury Emission from Artisanal and Small-Scale Gold Mining," by Sumali Agrawal, Technical Director, Yayasan Tambuhak Sinta; and
 2. "Commitment of the Government of Indonesia in the Implementation of the National Action Plan on Mercury Phase Out in Artisanal and Small-Scale Gold Mining in Indonesia," by Yun Insiani, Director for Management of Hazardous Substances, Ministry of Environment and Forestry.
- Session 2
 1. "General Overview of Direction of the Government of Indonesia's Policy for Restoration of Open Access Sites and Ministerial Decree Number 23 Year 2008," by Sulistyowati, Director for Restoration of Open Access Depletion, Ministry of Environment and Forestry;
 2. "Policy Review concerning Artisanal Mining or Environmentally Sound Mining," by Masnellyarti Hilman, Senior Advisor, Blacksmith Institute; and
 3. "Recommendation for Road Map of Mitigation of Mercury Contamination from Artisanal and Small-Scale Gold Mining in Indonesia," by Budi Susilorini, Blacksmith Institute.

In her conclusion at the end of the workshop, the Director for Management of Hazardous Substances highlighted 4 (four) major points, i.e. mercury hazard to the environment and human health, the need for alternative technology for environmental friendly gold processing, the need to update the NAP and MOEMR to conduct further coordination for the implementation of NAP.

D. Follow Up Actions

Following up the results from the inception workshop, in her capacity as the National Focal Point for the Minamata Convention on Mercury, the Director for Management of Hazardous Substances requested a small group discussion to review the existing NAP and to harmonize it with Annex C of the Minamata Convention,

1. Meeting on Thursday, 10 September 2015, at Parklane Hotel

The meeting was chaired by the Director for Management of Hazardous Substances, and attended by Drs. Hoetomo, MPA, as the moderator and MOEF's expert team; representative from Ministry of Energy and Mineral Resources; Aboejoewono Aboeprajitno, MOEF's expert team; and Blacksmith Institute. The discussion was concluded by the need to harmonize the existing NAP to the Annex C with Minamata Convention, and Blacksmith Institute was given a task to assist MOEF in writing recommendations for harmonization.

2. Meeting on Thursday, 17 September 2015, at the meeting room of Ministry of Environment and Forestry

The Director for Management of Hazardous Substances chaired the meeting that was attended by Drs. Hoetomo, MPA; Aboejoewono Aboeprajitno; and Blacksmith Institute. Referred to Annex C of the Minamata Convention and draft of UNEP's Guidance Document for Developing a National Action Plan to Reduce, Where Feasible, Eliminate Mercury Use in Artisanal and Small Scale Gold Mining, the attendees reviewed the existing NAP and MOEF's recommendations for NAP harmonization with Annex C of the Minamata Convention.

3. Lunch meeting with Ministry of Environment and Forestry, and Ministry of Energy and Mineral Resources (MOEMR) on Friday, 18 September 2015, at Best Western Premiere The Hive

The intention of this meeting was for MOEF to obtain initial response from MOEMR to accept MOEF's recommendations to harmonize the existing NAP, developed by MOEMR, with Annex C of the Minamata Convention. The NAP is currently in the process to be the Presidential Instruction and the MOEMR official was reluctant to accept such changes. However, she agreed if MOEF presented their recommendations for harmonization during the government stakeholders discussion that will be coordinated by the Secretary of State in the process of the Presidential Instruction.

In the effort to obtain technical knowledge and update from the field, Blacksmith joined the team that consisted of UNEP and YTS to the pilot project site in Desa Kebonsari, Pacitan Regency, Province of East Java. The team had an audience with the Head of Pacitan Regency who gave his support to the project that would provide mercury free alternative gold processing technique for the miners in one of few regencies where community mining area (Wilayah Pertambangan Rakyat/WPR) has been granted by MOEMR. In the field, Blacksmith visited the mercury free processing unit built by YTS, supported by Office of Mining and Energy of Pacitan Regency, and observed the Manado Method was being tested using ore from the local miner. At the same occasion, Blacksmith also visited a nearby backyard ASGM operation that practiced amalgamation. From the discussion with the owner, she did collect the amalgam balls and sell them only when she needs the money. Otherwise, she kept the amalgam balls at home.

E. Conclusion and Recommendation

Being the government liaison and the organizer of the inception workshop, Blacksmith may conclude as follow,

- 1) As the National Focal Point for the adoption of Minamata Convention in Indonesia, Ministry of Environment and Forestry has shown a strong commitment in the effort of mitigation of mercury impacts from ASGM, incl. to facilitate involvement from other stakeholders, incl. NGOs, in the implementation of NAP. Among others, this was shown by the engagement of the Director General for Management of Solid Wastes, Hazardous Wastes and Hazardous Substances; full support from the Directorate for Management of Hazardous Substances throughout the project implementation; and MOEF welcomes inputs concerning supporting public policy for mercury reduction and/or elimination.
- 2) Nonetheless, the implementation of NAP itself is a tough challenge. Beside the need to harmonize the NAP with Annex C of the Minamata Convention, the Government of Indonesia needs to elaborate the NAP into a list of detailed activities with feasible timeline and target for each activity not only as a guideline for all government stakeholders to take part based on their tasks and responsibilities (*tugas pokok dan fungsi*), but also to monitor and evaluate milestones that is achieved by each government stakeholder and the Government of Indonesia as a whole. Yayasan BaliFokus, as one of the main discussants, proposed the road map as presented by Blacksmith to be incorporated into the existing NAP so it will be in line with Annex C of the Minamata Convention.
- 3) As repeatedly stated by both the Director General for Management of Solid Wastes, Hazardous Wastes and Hazardous Substances, and the Director for Management of Hazardous Substances, the efforts to mitigate

mercury use in ASGM cannot be done by MOEF or the government stakeholders themselves, and they call out for active involvement from other stakeholders, incl. NGOs. Therefore, attendance from relevant stakeholders to the inception workshop was important to raise the awareness of the urgency of the issue as well as their engagement to the efforts. Two other stakeholders that also play an important role are the Local Government and the miners themselves.

- 4) During the inception workshop, there were concerns from the floor that need to be addressed by the Government of Indonesia as the key player of the mitigation effort:
 - ASGM requires the Government of Indonesia to legalize their operation and it is important to have the miners' commitment to succeed in the effort of mitigation of mercury use in ASGM;
 - Mercury has been identified that it is also produced locally (cinnabar mining), while MOEMR stated that they have never released permit for cinnabar mining;
 - The Local Government's objection with responsibilities that they have to bear as a consequence of ASGM formalization, incl. local budgeting to support the implementation;
 - Miners are not incapable of finding out the appropriate alternative technology for gold processing;
 - The Local Government has seen ASGM grows within their authority, such as in Banyuwangi Regency, Province of East Java, where ASGM is done within a conservation forest, and needs assistance to come up with solution to respond to this condition;
 - The need to align programs concerning ASGM with the local fiscal year;
 - Responsibility on restoration of ex illegal mining sites;
 - The Local Government supported the revision of the Ministerial Decree Number 23 Year 2008, but suggested to align the terms used in the revision draft with the Law Number 4 Year 2009 about Mineral and Coal Mining; and
 - The Local Government's enthusiasm in supporting and cooperating with MOEF for inventory of mercury use, promotion of non-mercury gold processing alternative techniques, and cleaning up contaminated sites.
- 5) Time constraint in distributing the invitation and confirming the attendance is another challenge to obtain representation from the intended stakeholders, as well as if the representative has the authority to bring the message to their institution and mobilize commitment.

Having observed the inception workshop, there are recommendations that can be taken into consideration for the next workshop and carrying out the project implementation,

- 1) As the National Focal Point for the Minamata Convention, MOEF should be playing its role both as the coordinator of the efforts and the clearing house of data/information/activities concerning mercury. Thus, other stakeholders to extend goodwill to coordinate and communicate with MOEF.
- 2) Having established 2018 as the year for mercury reduction/elimination in ASGM, MOEF should lay out a strategy to evaluate the existing NAP or to produce a "shadow" road map that will fit into MOEF's tasks and responsibilities to accelerate the efforts through planning and implementing do-able activities with feasible targets. In doing so, MOEF needs to direct interests or supports from other stakeholders, incl. NGOs and international donors, to align with MOEF programs to support the Government of Indonesia in fulfilling the NAP.
- 3) As the Government of Indonesia is moving toward to legalize the ASGM, it is important not only to provide the legal framework and disseminate the initiative to the Local Government and miners, but also to list down the detailed activities, challenges that may occur and the solutions, and consequence that it may carry out, such as capacity building of the Local Government and to make sure that the Local Government has sufficient financial resources to carry out their tasks.
- 4) In regards to coordination among stakeholders, MOEF may establish a multi-stakeholders forum or leverage the existing forum/group to meet regularly (once every 6 months) for discussion concerning mercury use in ASGM. The topic may vary from progress update on the implementation of NAP, policy review, information sharing and/or database update.
- 5) The conclusion workshop should be planned early in advance to expect representation from intended stakeholders.
- 6) Progress from the project implementation should not only be delivered during the conclusion workshop, but also well documented and reported to the Ministry of Environment and Forestry as a reference to move forward.

F. Photos



Photo 1. Coordination meeting with MOEF and MOEMR on 10 August 2015.



Photo 2. Reporting preparation of the inception workshop to the Director General for Management of Solid Wastes, Hazardous Substances and Hazardous Wastes on 31 August 2015.



Photo 3 (by Alice Concorde!) Media briefing with resource persons consisted of representatives from (left to right) Blacksmith Institute, Ministry of Energy and Mineral Resources, Ministry of Environment and Forestry, Yayasan Tambuhak Sinta, and the United Nations Environment Programme.



Photo 4a (by Alice Concorde!) Presentation from the Director for Management of Hazardous Substances.



Photo 4b (by Alice Concorde!) Presentation from Yayasan Tambuhak Sinta.



Photo 4c (by Alice Concorde!) Presentation from the Director for Restoration of Open Access Depletion.



Photo 5 (by Alice Concordel) (left to right) Main discussants from Ministry of Environment and Forestry, and Ministry of Energy and Mineral Resources, and Masnellyarti Hilman (Blacksmith Institute)



Photo 6 (by Alice Concordel) National and international participants.



Photo 7 (by Alice Concordel) Team audience with the Regent of Pacitan on 3 October 2015.



Photo 8 (by Alice Concordel) Backyard smelter in Desa Kebonsari was currently practicing whole ore amalgamation.



Photo 9 (by Alice Concordel) A mercury free gold processing and training facility that was built by YTS in Desa Kebonsari.



Photo 10. Follow up meeting on the initiative for harmonizing the NAP with Annex C of the Minamata Convention.

Annex II: Report on Concluding Workshop

CONCLUDING WORKSHOP

Jakarta, 30th November 2015

A. Background

During the Initial Workshop held on 1 September 2015, Yayasan Tambuhak Sinta (YTS) presented the different characteristics of ores and gold processing methods, as well as the relative impact on the amount of mercury used and released into the environment. Using a triangulation model, YTS explained how hard rock processing using whole ore amalgamation (WOA) is the country's primary source of mercury pollution, considering that WOA is a common process in artisanal small-scale gold mining (ASGM) in Indonesia.

The Government of Indonesia, having signed the Minamata Convention on Mercury on 12 October 2013, has made a strong commitment to reduce/eliminate the use of mercury in ASGM activities in Indonesia. This commitment is stated in the National Action Plan (NAP) on Mercury Elimination in ASGM in Indonesia, and currently aims to end mercury use in ASGM by 2018.

This target date of 2018 presents a major challenge for the government and other stakeholders. The deadline gives rise to a need for discussion on the various matters to be raised in this workshop including: the formalization of ASGM communities; opportunities for mainstreaming mercury-free gold processing techniques; the readiness of sub-national governments and the support from Central Government, as well as the need for funding for ASGM empowerment and the recovery of mercury-contaminated lands. The urgent need to harmonize the NAP with Annex C of the Minamata Convention, the need for more stakeholder involvement (inclusion of artisanal gold miners), and the development and enforcement of regulations concerning ASGM will also be discussed during the workshop.

B. The Conclusion Workshop

The conclusion workshop was held in Kalpataru Room, Ministry of Environment of Forestry (MOEF), Building B, 2nd Floor, Jl. D.I. Panjaitan Kav. 24, Kebon Nanas, Jakarta Timur, with approximately 30 participants whom represented the relevant government institutions, local government, foreign government, international institutions, university and NGOs.

In her opening speech, the Director for Management of Hazardous Substances highlighted the Government of Indonesia's commitment to the implementation of the Minamata Convention through eliminating mercury use in ASGM. Therefore, having a clear action plan is essential and that shall include technology intervention for mercury-free gold processing method and supporting legal base through revision of the Minister of Environment Regulation No. 28 Year 2008. Thus, the ASGM sector will be empowered to make economic contribution.

Session 1 : Progress Reports

3. "Zero-Mercury Gold Processing Technology in Pacitan District," by Sumali Agrawal, Technical Director, Yayasan Tambuhak Sinta
 - YTS started its work in Central Kalimantan where 50 ASGM major hotspots were identified, incl. Mount Muro where mercury is extensively used in gold processing.
 - YTS expanded the work to South Kalimantan and perceived Pelai Hari as a potential pilot site. However, social conditions – in which ball mills are used on rental basis and miners are not part of the regular cycle in order to benefit from the introduction of alternative method – removed Pelai Hari as pilot site option.
 - ASGM in Pacitan operates in Wilayah Pertambangan Rakyat (WPR; community mining areas) where ores are processed individually in 87 households using mercury. YTS used an individual approach and interaction not only to understand the problem, but also to obtain information and expose the miners to the alternative method.
 - Training was done using a training-of-trainers method to leverage local miners' capability and confidence in understanding and adopting gravity separation in recovering gold without mercury.
 - Besides the Manado Method, YTS also demonstrated the used of advanced gold recovery technology, i.e. shaking table, for miners to see available options and let them decide.
4. "Proposed Draft for Revision of Regulation of Minister Environment No. 23 Year 2008," by Masnellyarti Hilman, Advisor, Blacksmith Institute

- The proposal had been followed up by MOEF through several meetings and one of the highlights is to change the title from “prevention” to “control.”
 - The revised draft includes articles to simplify ASGM licensing process using Surat Pernyataan Pengelolaan Lingkungan Hidup (SPPL; statement for environmental management), efforts to mitigate environmental pollution and degradation become the obligation of miners and local government, capacity building, remediation and rehabilitation, financial resources in carrying out the obligations, and incentives given to miners and local government for adopting environmental friendly mining.
5. “Proposed Harmonization of NAP with Annex C of the Minamata Convention,” by Budi Susilorini, Indonesia Country Coordinator, Blacksmith Institute.
- Elaborating inputs in the inception workshop to align the existing NAP with the Minamata Convention, Blacksmith assisted MOEF in drafting recommendations to harmonize the NAP with the Minamata Convention.
 - Recommendations include adding quantitative targets in mercury reduction; adding components – incentive and disincentive, environmental recovery and law enforcement; evaluate NAP implementation and formulate a strategy to accelerate efforts towards mercury phase out through setting short term, middle term and long term priorities; and for MOEF to establish an umbrella NAP to elaborate NAPs from all sectors.

Session 2 : Discussion

6. Ministry of Energy and Mineral Resources
- The existing NAP is built on three components, i.e. (1) strengthening legal aspect, (2) research and development, and (3) communication and awareness raising.
 - MOEMR has built intensive coordination with 12 ministries to implement NAP, incl. establishing a communication forum, collaborating with BPPT for research and development of alternative techniques, and revisions in policy.
4. Ministry of Environment and Forestry, “ Database on Open Access Area”
- MOEF, in cooperation with universities, has done inventory of open access area caused by artisanal mining in 29 provinces – 302 locations. The inventory is focused on 4 aspects, i.e. environmental degradation, past and ongoing conflicts, miners’ wellbeing and commitment from the local government.
 - Rehabilitation of open access area shall abide by the area spatial plan and MOEF already set a target to facilitate rehabilitation in 25% of total open access area by 2019.
 - Rehabilitation is expensive while the government budget is limited. So, potential financial resources are explored, incl. DAK (special fund allocation) and CSR.
7. Ministry of Health, “Developing NAP on Mitigation Health Impacts from Mercury Exposure”
- Due to limited budget, research and treatment for diseases caused by chemical, incl. mercury, has not become a priority yet. On the other hand, the treatment for mercury poisoning is expensive and symptoms are difficult to diagnose.
 - Prevention becomes critical and it involves 4 aspects, i.e. how to prevent it to enter human body, promotive, curative – early diagnosis, and need for rehabilitative effort.
 - MOH NAP is developed referring MOEMR NAP, and the components incl. mapping ASGM areas, coordination with MOEMR, identification of Puskesmas (community health center), developing guideline on mercury control, early detection and surveillance on mercury disease, public awareness raising, and improving laboratory capacity with supporting technician.
8. Ministry of Small Medium Enterprises and Cooperative, “Policy for Empowering Artisanal Miners”
- MOSMEC supports ASGM as long as the sector abides by the regulation, incl. operating in WPR and adopting mercury-free gold processing.
 - Additionally, MOSMEC is interested in business diversification aside from mining, such as agriculture and fishery.
 - Challenges on artisanal mining, incl. technology, capital, human resources, educational level, skill, competence, productivity and licensing.
9. Indonesian Artisanal Miners Association (APRI)
- Legalization has become the most important issue in ASGM and, referring to the Mining Law No. 4 Year 2009, artisanal mining shall be prioritized.
 - To recommend responsible mining through forming a collective group in which miners shall be empowered and educated, before environmental friendly technology can be introduced. Or, they can be implemented in parallel.
 - APRI has declared to phase out from mercury use by 2018 and request no criminalization during the transition period.

Points from Discussion

- A recommendation to MOEF to check with Min. of Finance if tax exemption may be applied to imported goods for mitigation of environmental pollution and degradation. Thus, this will decrease the price of shaking table. Shaking table can also be made locally.
- The importance of understanding the ore characteristic not only to find the most effective method for gold recovery, but also to get a more accurate estimate on gold recovery.
- Izin Pertambangan Rakyat (IPR; community mining permit) procedure is intended for miners to abide by the law and the implementation shall consider local conditions. For example, the environmental impacts caused by tin mining in Bangka – Belitung resulted in a recommendation for ASM to partner with the licensed mining company. Piloting and implementation are done in stages due to limited government capacity and funding availability. Therefore, the GOI is willing to cooperate with NGOs that operate in areas the GOI cannot reach.

In her closing speech, the Director for Management of Hazardous Substance stated that the workshop has been able to disseminate the project implementation,

1. Success story from Pacitan,
2. Revision of the Minister Regulation No. 23 Year 2008, and
3. Harmonization of NAP with the Minamata Convention.

ASGM formalization is the main goal, and the GOI and other stakeholders have a commitment to eliminate mercury in ASGM by 2018.

C. Stakeholders Meetings on Policy

In addition to its main task to be the liaison to the Government of Indonesia, Blacksmith Institute continues to support the Government of Indonesia by recommending policies for environmental friendly ASGM, e.g. harmonization of NAP to the Minamata Convention (as reported in the inception workshop) and revision of the Minister Regulation No. 23 Year 2008.

Under coordination of the Directorate of Rehabilitation of Open Access Degradation, Directorate General for Control of Environmental Pollution and Degradation, a series of stakeholders meetings were held from 15 October to 17 November 2015. The sessions discussed the policy draft submitted by Blacksmith Institute that elaborated inputs from MOEF, MOEF Expert, YTS and APRI. Blacksmith assisted in revising the regulation and its annex to align with the revised regulation draft.

Revisions include,

- To change the title from “Prevention of Environmental Pollution and Degradation caused by Artisanal Gold Mining” to “Controlling Environmental Pollution and Degradation caused by Artisanal Gold Mining Activities.”
- To add new legal basis, incl. Mining Law No. 4 Year 2009, Local Government Law No. 23 Year 2014, Village Law No. 6 Year 2014, and Forestry Law No. 41 Year 1999.
- To adjust definitions in alignment with the newly adopted regulations.
- The regulation does not only intend to prevent, but also to mitigate and to recover the environment from implications of ASGM activities.
- To elaborate that environmental aspects be considered not only in determining location for community mining areas (WPR/Wilayah Pertambangan Rakyat), but also to establish requirements in obtaining gold mining and processing permits.
- To provide a clear guideline and to simplify the process in obtaining permits.
- To differentiate gold processing from gold mining.
- In accordance with the Minamata Convention and NAP, the new draft clearly states that mercury still can be use by using a retort and/or other measures, but mercury use shall be phased out by 2018 and violation will cause sanction.
- Government – Central and Local – shall provide coaching and assistance to ASGM in formalization process and efforts toward environmental friendly ASGM.
- New articles are added to accommodate incentives and environmental recovery.

D. Photos



Photo 1. Chairperson: the Director for Management of Hazardous Substances



Photo 2. Participants came from different institutions.



Photo 3. Discussing revision draft and annex with MOEF and MOEF - 26 Oktober 2015



Photo 4. Discussing revision draft and annex with MOEF, APRI and BaliFokus – 17 November 2015

E. Annexes

1. Agenda
2. Attendance list
3. Minutes of meeting
4. Proposed draft for revision of Regulation of Minister Environment No. 23 Year 2008
5. Proposed harmonization of NAP with Annex C of the Minamata Convention
6. Presentation materials

Annex III: Project Logical Framework

Component 1 - Initial Stakeholder Consultations:

Goal: To consult with government and other stakeholders at national and sub-national levels.

Activity 1. Networking & Advocacy			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
a. <u>Networking:</u>	- Hold regular meetings		SA
<ul style="list-style-type: none"> - Relevant government officials at MoEF and MoEMR (Jakarta) know about the project and support our aims 	<ul style="list-style-type: none"> - Hold networking events - Update stakeholders with project information - Assist ministries to build capacity on ASGM issues 		RM BS/MH PO's
b. <u>Advocacy:</u>	- Investigate legal and regulatory environment for specific project sites		SA
<ul style="list-style-type: none"> - Relevant data and information is provided about responsible ASGM practices including mining, processing, and formalization issues 	<ul style="list-style-type: none"> - Provide guidance for technical interventions and other approaches for specific project sites 		RM BS/MH PO's
Activity 2. Monitoring & Reporting			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
c. <u>Monitoring/Reporting:</u>	- Monitor and report on process and outcomes of meetings in Jakarta during May/June/July		SA
<ul style="list-style-type: none"> - Meeting Notes - Report on Component 1 			RM BS/MH PO's

Indicators of Success

- Government Endorses UNEP Project Activity
- Government Provides Support to Project Site

Component 2 – Initial Workshop:

Goal: To discuss project aims and Hg-assessment methodology with government and UNEP.

Activity 1. Collecting & Presenting Field Findings			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
a. Presentations:	-Assemble field data		SA
- YTS Presentation	-Make PPT and Paper		UNEP
- UNEP Presentation	-Consult with UNEP and MoEF on timing of event		
b. Discussions:	-YTS to present field		SA
- YTS, UNEP, MoEF, agree on a methodology to quantify Hg emissions	findings on Hg Emissions from several ASGM sites		UNEP
- MoM and MoEF endorse project aims and purposes	-UNEP to present their Toolkit for Hg Evaluation		
Activity 2. Reporting & Follow-Up			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
c. Reports:	- Attend event and report on process and outcomes of initial workshop to be held in Jakarta (August 2015)	-	SA
- Workshop Notes			BS/MH
- Report on Component 2			

Indicators of Success

- Agreement on Methodology for Collection of Baseline Data on Hg-Emissions
- Government Endorsement of YTS/UNEP Project Aims and Approach

Component 3 – Baseline Survey:

Goal: To gather baseline information at the project site(s).

Activity 1. Select Site & Collect Data			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
a. <u>Selection of Project Site:</u> - Knowledge of site area - ASGM engagement plan	-Identify a project site with conditions suitable for project operations.		SA PO's
b. <u>Baseline Information:</u> - on Mercury Emissions - on Economy of ASGM - on Health Awareness	-Conduct formal and informal data collection -Consolidate data and cross-check with other comparable data		SA PO's
Activity 2. Reporting			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
c. <u>Reports:</u> - Baseline Study - Report on Component 3	-Compile field data into a complete baseline study -Write report on process		SA PO's

Indicators of Success

- Good early relationships with ASGM community at selected site(s)
- High levels of quantitative and qualitative information about the site(s)

Component 4 – Establish Mercury Free Facility:

Goal: Establish Alternative Ore Processing Centre for Long Term Operations.

Activity 1. Implementation			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
a. Local Agreements:			SA
- Site Use Agreement	-Negotiate agreement to establish a training facility		PO's
- Operational Agreement	-Negotiate agreements for supply of ore and tailings		Locals
b. Site Infrastructure:			SA
- Processing Shed	-Establish Hg-free location		PO's
- Grinding Equipment	-Establish Water & Power		Locals
- Sluice Equipment & Ijuk	-Dig Retention Ponds		
- Panning Ponds & Pans	-Ship Equipment		
- Secondary Processing	-Install Equipment		
- Tailings Storage Pond	-Test Equipment		
Activity 2. Reporting			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
c. Hg-Free Facility:			SA
- Local Partner for Center	Evaluate local partnership arrangements		
- Fully Operational	Evaluate operations		
- Report on Component 4	Write report on facility		

Indicators of Success

- Good working partner relationships with local operators
- Successful installation and testing of alternative processing technologies

Component 5 – Field Demonstrations:

Goal: Demonstrate alternative processing methods and improved gold recovery.

Activity 1. Conduct Demonstrations			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
<u>a. List of Participants:</u>	- Discuss alternative processing with bosses		SA
- Local Bosses Identified			PO's
- Commitments to Provide Ore for Demonstrations	- Offer training assistance - Offer other support		
<u>b. Miner Training Events:</u>	- Train two local trainers		SA
- Thirty Demonstrations	- Conduct demonstrations		PO's
- High Miner Attendance	- Conduct follow-up		Trainers
- Assisted Adoption	- Support adoption sites		
Activity 2. Reporting			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
<u>c. Behaviour Change:</u>	- Evaluate training results		SA
- Delivery of Training	- Assess project impacts		PO's
- Examples of Adoption	- Write monitoring report		
- Report on Component 5			

Indicators of Success

- High levels of miner-to-miner interaction at training site
- Adoption of alternative technology by ore-processors at other sites

Component 6 – Awareness Raising Campaign:

Goal: Raise stakeholder awareness and effect changes in behaviour to mitigate harmful exposure to Hg.

Activity 1. Outreach			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
<u>a. Campaign for Hg Users:</u>	Meet with Miners, Gold Shops, Processors		SA
- Successful Outreach			Alliah
- Public Meetings Held			I&C
<u>b. Campaign for Women:</u>	Meet with Health Dept., Posyandu & Puskesmas and Local Community		SA
- Successful Outreach			Alliah
- Public Meetings Held			I&C
Activity 2. Reporting			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
<u>c. Documented Benefits:</u>	- Evaluate data		SA
- Evaluation of Impacts	- Assess project impacts		Alliah
- Report on Component 6	- Write monitoring report		

Indicators of Success

- Documented Behaviour Change by Mercury Users (men)
- Increased Levels of Community Health Awareness in Comparison with Baseline Levels (women)

Component 7 – Monitoring & Documentation:

Goal: Demonstrate positive project impacts in terms of mercury reduction and other benefits.

Activity 1. Collect Data			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
<u>a. Quantitative Data on:</u>	- Document the reduction in Hg use and emissions		SA
- Mercury Recycling			PO's
- Mercury Reduction	- Document the health benefits to communities		
- Mercury Elimination			
- Equipment Distribution	- Document increased gold recovery / lower costs		
- Better Gold Recovery			
<u>b. Qualitative Data on:</u>	- Collect stories of change		SA
- Mitigation of Harm	- Seek behaviour changes		PO's
- Adoption of Technology	- Photograph involvement		
- Levels of Awareness	- Note improvements		
- Economic Benefits	- Measure impacts		
Activity 2. Reporting			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
<u>c. Documented Benefits:</u>	- Evaluate field data		SA
- Evaluation of Impacts	- Assess project impacts		PO's
- Report on Component 7	- Write monitoring report		

Indicators of Success

- Comparative Qualitative and Quantitative Data Sets
- Third Party Confirmation of Results (other stakeholders)

Component 8 – Final Stakeholder Consultations:

Goal: Disseminate project results to stakeholders and present recommendations.

Activity 1. Dissemination of Results & Recommendations			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
a. Results:	-Discuss benefits of our technological approach		SA
- More understanding of low-technology solutions and miner participation	-Discuss benefits of our participatory approach		RM
			BS/NH
b. Recommendations:	- Make best practice recommendations to district, provincial and national governments		SA
- Technical Best Practice			RM
- Policy Best Practice			BS/NH
- Follow-up Required			
Activity 2. Report			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
c. Monitoring/Reporting:	- Monitor and report on process and outcomes of meetings (Sept/Oct/Nov)		SA
- Minutes of Meetings			RM
- Report on Component 8			BS/NH

Indicators of Success

- Project Results Discussed With Stakeholders
- Project Recommendations Accepted By Stakeholders

Component 9 – Conclusion Workshop:

Goal: Disseminate Findings & Make Recommendations to National Government.

Activity 1. Collect Data			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
a. <u>Data on Hg-Reduction:</u> - Recycling Results - Elimination Results	Assemble and present all field data on environmental health benefits of interventions		SA
b. <u>on Economic Benefits:</u> - Cost Saving Measures - Increased Gold Recovery - Average Income Levels	Assemble and present all field data on economic benefits of interventions		SA
Activity 2. Report			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
c. <u>Reports:</u> - Workshop Notes - Report on Component 9	-Document feedback from participants at workshop -Write notes on workshop process and outcomes		SA RM BS/MH

Indicators of Success

- Demonstrated Economic, Environmental, and Community Health Benefits
- Pro-Active Government Response to Project Outcomes

Component 10 – Final Report:

Goal: Meet all Reporting Deadlines to UNEP

Activity 1. Final Report on Project Activities			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
a. <u>Compilation of Reports:</u> - Summary of Activities - Summary of Outcomes - Photo Documentation	- Compile all reports on the project components - Evaluate environmental, social, economic outcomes		SA
b. <u>Final Narrative Report:</u> - Description of overall project delivery, results, challenges, and findings	- Write final report		SA
Activity 2. Financial Report			
Expected Outcomes	Tasks & Timeline	Progress Made	PIC
c. <u>Final Expense Report:</u> - Reconciliation - Return of Excess Funds	- Prepare financial report and submit by due date		SA YK

Indicators of Success

- Final Narrative Report Submitted On Time
- Financial Report Submitted On Time

Annex IV: Photos

APRIL 2015 – SOUTH KALIMANTAN



1. *Small-scale gold mining activities in Punung Village*
2. *ASGM extraction site in Sultan Adam Forest Park*
3. *Miners collecting ore to transport to Bunglai Village*
4. *ASGM extraction site in Talain Village*
5. *Miners from Pamalongan Village sorting ore for transport to a processing site*



MAY 2015 – SOUTH KALIMANTAN



1. *Ore processing site in the village of Kampung Jawa, Tanah Laut District*
2. *One kilogram of mercury is weighed*
3. *Ore processing site in Tambang Ulang Village*
4. *A miner in Tambang Ulang shows his daily gold recovery*
5. *YTS staff meeting with the Head of the Health Clinic in Pelaihari*

JUNE 2015 – BANYUMAS DISTRICT, CENTRAL JAVA



1. *Making concentrate by the Manado Method*
2. *Weighing 5kg samples of concentrate*
3. *Bulk ore testing facility in Bekasi*
4. *Ore slurry flowing to sluice box filled with ijuk matting that captures fine gold particles*
5. *Collecting the concentrate in bags*



JULY 2015 – PACITAN DISTRICT, EAST JAVA



1. *Tunnel shafts at the Tumo Hill site*
2. *Panning crushed ore samples to test for free gold*
3. *Women working as rock crushers in Kebonsari Village*
4. *Quartz vein being crushed in Kebonsari Village*
5. *Formerly*





6. *Kendalisodo Hill, one of three hills to get rock in Kebonsari*
7. *Contaminated tailing with Hg in a villager's tromol*
9. *A tunnel in*

AUGUST 2015 – PACITAN DISTRICT, EAST JAVA



1. *Digging collection pond for new demonstration centre*
2. *Building retaining walls for tailings collection pond*
3. *Finished collection pond with three separation tanks*
4. *A child beside a typical backyard processing*



SEPTEMBER 2015



1. *Gathering information from women*
2. *Implementation of site infrastructure*
3. *Crushing the rock*
4. *Grinding and unloading process*
5. *Concentrate*

OCTOBER 2015



1. *Preparing the ijuk*
2. *Unloading process from tromol to ijuk*
3. *Slurry moving through ijuk and carpet*
4. *Panning process*
5. *Health campaign with women*
6. *Painting by children for health campaign*
7. *Women show support to reduce and eliminate Hg use*

NOVEMBER 2015

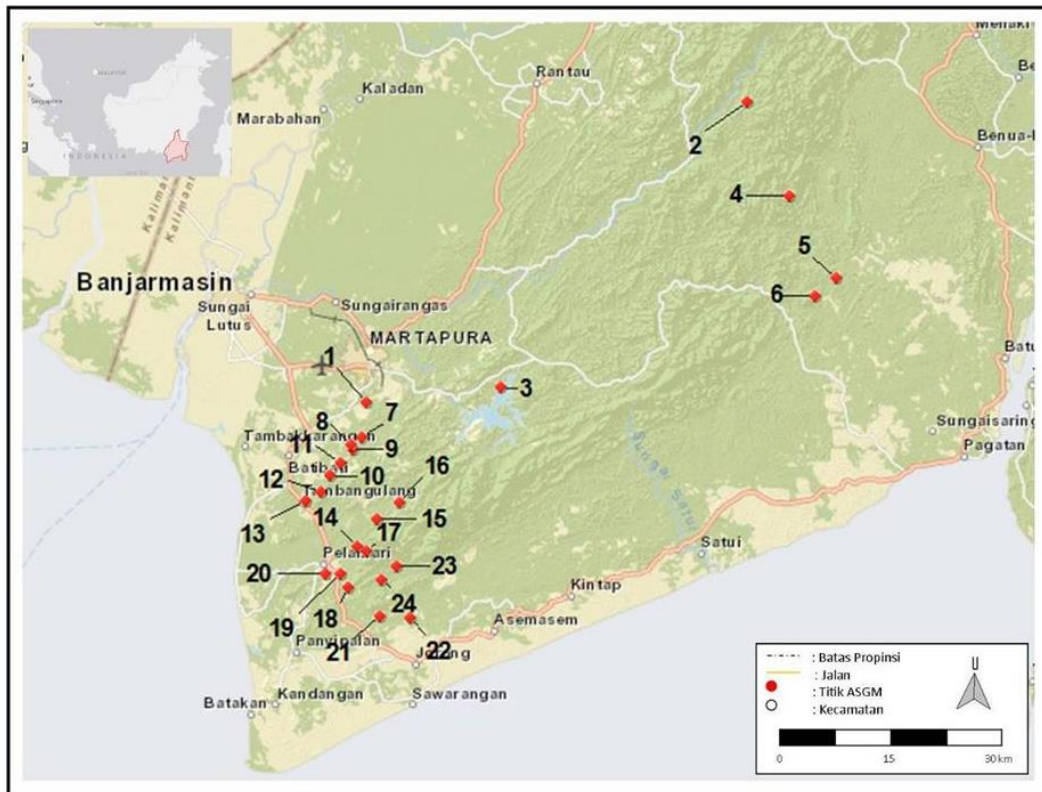


- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Miners in Kebonsari Village, Pacitan District 2. Miners join actively in the training of gold processing with ijuk use 3. Participants work together in unloading process 4. A participant takes ijuk from the sluice box 5. ASGM team explains about how to use ijuk on the gold processing 6. Pouring the concentrate out for panning 12. A miner puts his hand to support the program | <ol style="list-style-type: none"> 7. Trying to pan 8. Paying attention to the work way of shaking table 9. Informing alternative technology to process gold without Hg use 10. Explaining about the health impacts of Hg use on gold processing 11. Showing painted hand to support Hg reduction and elimination |
|---|--|



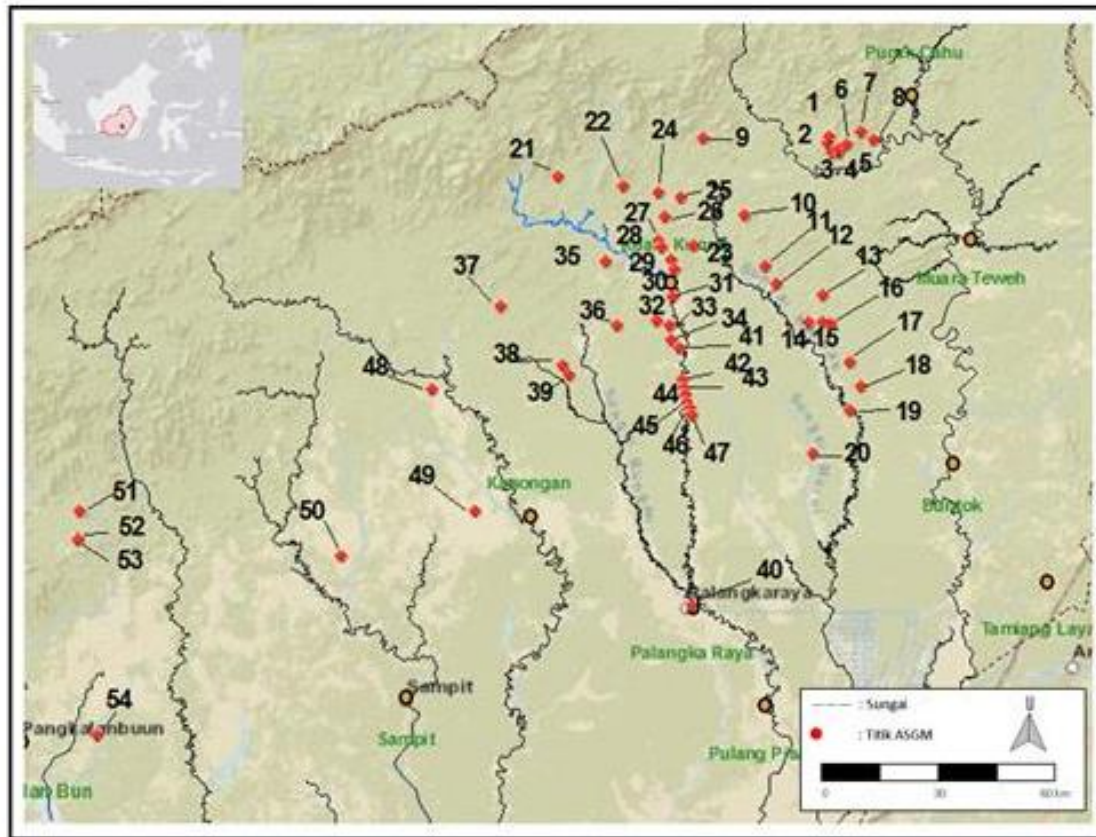


1. *Media distribution to women*
2. *Delivering health campaign message to women in PKK RT*
3. *Health socialization and discussion with women in Kayen hamlet*
4. *Sharing and asking women to protect their health from mercury poisoning*
5. *(a&b) Health education on the hazardous of mercury in SDN Tinatar 1*
6. *(a&b) Health education on the hazardous of mercury in MTs Muhammadiyah 11 Tinatar*
7. *(a&b) Health education on the hazardous of mercury in SDN Kebonsari*



- | | | | |
|---------------------|------------------|----------------------|-------------------|
| 1 Pumpung | 7 Simpang Asahan | 13 Tambang Ulang | 19 Talain |
| 2 Danau Huling | 8 Kait-kait | 14 Bajuin | 20 Karang Jawa |
| 3 Bunglai | 9 Kait-kait Baru | 15 Tanjung | 21 Durian Bungkok |
| 4 Bandara | 10 Martadah | 16 Tebing Siring 1&3 | 22 Batu Kapit |
| 5 Batu Harang | 11 Martadah Baru | 17 Sungai Bakar | 23 Pelombokan |
| 6 Mi'ing (& Payang) | 12 Sungai Pinang | 18 Tampang | 24 Galam |

ASGM Site Mapping in Central Kalimantan



- | | | | | |
|--------------|-------------------|-------------------|--------------------|---------------------|
| 1 Jiwa | 14 Kota Baru | 26 Teluk Nyatu | 35 Tumbang Jutuh | 47 Hanua |
| 2 Halubai | 15 Kayu Bulan | 27 Tewang | 36 Bereng Baru | 48 Tumbang Samba |
| 3 Kerikil | 16 Masaran | Pajangan | 37 Taringen | 49 Kereng Pangi |
| 4 Pulau Gita | 17 Lawang Kamah | 28 Tumbang Miwan | 38 Takaras Kampung | 50 Paranggean |
| 5 Dusun muro | 18 Lungkuh Layang | 29 Tumbang Hakau | 39 Takaras Kota | 51 Sungai Seribu |
| 6 Permata | 19 Timpah | 30 Dahian Tambuk | 40 Pasar Pahandut | 52 Pangkut |
| 7 Mangkahui | 20 Murui | 31 Tuyun | 41 Tangkahan | 53 Terminal Pangkut |
| 8 Marindu | 21 Tumbang Miri | 32 Sepang Simin | 42 Bawan | 54 Aspai |
| 9 Sei Hanyu | 22 Tewah | 33 Sepang Kota | 43 Goha | |
| 10 Jangkang | 23 Hurung Bunut | 34 Pematang Limau | 44 Pahawan | |
| 11 Dandang | 24 Kuala Kurun | | 45 Tambak | |
| 12 Bajuh | 25 Petak Bahenda | | 46 Ramang | |
| 13 Pujon | | | | |

