Investigate the OHS Issues Associated with Small-scale and Artisanal Mining in Ghana

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Key theme: Governance and regulation
Community and environmental sustainability

Key countries: Ghana
Completion: February 2014

Research aims:
This research sought to address the following:
• Understand the dynamics of small scale and artisanal mining
• Identify the safety challenges
• Gain knowledge to assist better management of associated “flow on” effects related to environmental and social issues

For further information on this action research:
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Investigate the occupational, health and safety issues associated with small scale and artisanal mining in Ghana

From a development perspective, artisanal and small-scale mining is one of the most complex economic sectors of Ghana, but the extent of this type of mining is very difficult to quantify and a clear understanding of the country’s Occupational Health and Safety management in the sector is missing. The population engaged in artisanal and small-scale mining is largely nomadic and illiterate, and no reliable statistics exist. There are no meaningful systems, processes or models in place from which to develop Occupational Health and Safety programs or deliver them once health and safety challenges have been identified. Additionally, the lack of formality in this sector significantly affects worker safety and the ability of the inspectorate to provide assistance to those engaged in activity.

Artisanal and small-scale mining is frequently labour intensive, and usually employs a semi-skilled or unskilled workforce with low levels of mechanisation, production, productivity, recovery and efficiency. Most recently, artisanal miners have been categorised as a vulnerable group in a document released by the United Nations Development Program.

This project involved visits to two artisanal mines, displaced communities and one large-scale mine in Ghana, where interviews were held with key personnel. Discussions were held with the Chief Mining Inspector and Senior Mining Inspectors regarding collaboration, and linkages established with academics at the University of Mining and Technology. The report details the findings from these visits and provides guidance on where to target interventions that will have the most impact on improving health and safety within the sector in Ghana. Technical assistance programs that may be developed aimed at improving practices in Ghana could be introduced and customised to the artisanal and small-scale mining sectors in other countries. Programs developed from this project may provide an opportunity to also minimise risk for large-scale mining companies, such as where artisanal and small-scale miners use the same underground workings as large scale mining operations, and may be used to direct further research interventions.
Title: Investigate the OHS issues associated with small scale and artisanal mining in Ghana

IM4DC Activity Number: 62000301LA

IM4DC Program stream: Action Research (Commissioned)

Initiation Date: 11/10/2013

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<td>This project aligns directly with IM4DC’s stated aims of improved knowledge of a country’s resource base; improved legislative frameworks; and an ability to continue to build local capacity in minerals governance and mining. Additionally, it is envisaged findings will assist with providing information on ways to improve policies and practices in the governance and management of extractive industries and their interactions with society and the environment.</td>
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<td>The project extended across all strategic planning areas. These areas are listed below in order of priority:</td>
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<td>• Health and safety of resources communities and workforces</td>
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Types of activities undertaken

- Formal and informal interviews as detailed in report (full list in appendix 1)
- Discussion with Chief Mining Inspector and Senior Mining Inspectors regarding collaboration and how to move forward with assistance in the area of legal small scale and artisanal mining operations in Ghana
- Discussion with Professor Newton Amegbey, Dean, Faculty of Mineral Resources Technology University of Mining and Technology (UMaT)
- Field Trips - 2 artisanal mines
  1 large scale mine
  Volta River Power Station – visit to displaced communities

Schedule

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<th>Conclusion</th>
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<td>• ASM miners are largely illiterate, and speak many local dialects</td>
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<td>• No OHS training/advice currently provided by Minerals Commission</td>
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<td>• Most effective mechanism to improve OHS for ASM is to provide “Train the Trainer” OHS training of mines inspectors who can then train the district officers who can inform and educate the ASM using their local dialect.</td>
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<td>Other outcomes</td>
<td>• Collaboration established with Mining Inspectorate Division Minerals Commission Ghana including discussion regarding how to move forward with assistance in the area of legal small scale and artisanal mining operations</td>
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<td>• Linkages established with University of Mining and Technology UMaT (Tarkwa)</td>
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<td>• Linkages with Africa Short Course participants holding senior government positions in their respective countries</td>
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(See appendix 2 for full list of links established)
Introduction

From a development perspective small and artisanal mining (SAM) is one of the most complex economic sectors of Ghana, but the extent of SAM is very difficult to quantify and a clear understanding of the country’s Occupational Health and Safety (OHS) management in the sector is missing. Recent discussions with visiting inspectors from the Minerals Commission of Ghana indicated they would welcome support from MISHC to assist with managing the OH&S challenges they face within the small and artisanal mining sector. The opportunity to join the Africa-Australia Short Course – OHS & E Group in Ghana in October of this year provided an opportunity to gain an understanding of the dynamics of SAM, to meet with representatives from the Minerals Commission to further discuss the problems they are encountering and how they see assistance could be provided in this area, and to better understand the “flow on” effects related to environmental and social issues.

A major challenge facing the Mining Inspectorate is that the population engaged in SAM is largely nomadic, illiterate, and no reliable statistics exist. There are no meaningful systems, processes or models in place from which to develop OHS programs or deliver them once health and safety challenges have been identified. Additionally, the lack of formality in this sector significantly affects worker safety and the ability of the inspectorate to provide assistance to those engaged in SAM activity.

SAM is frequently labour intensive, and usually employs a semi-skilled or unskilled workforce with low levels of mechanisation, production, productivity, recovery and efficiency. Most recently, artisanal miners have been categorised as a vulnerable group in a document released by the United Nations Development Program.

While in Ghana two artisanal mines were visited and interviews arranged with key personnel identified as being able to provide information on the SAM sector. This report details the findings from this visit and provides guidance on where to target interventions that will have the most impact on improving health and safety within the SAM sector in Ghana. Technical assistance programs that may be developed aimed at improving practices in Ghana will enable the development of programs that can then be introduced and customised to the SAM sectors in other countries. Additionally programs developed from this project may also provide an opportunity to minimize risk for large-scale mining companies such as where SAM miners use the same underground workings as large scale mining operations, and may also be used to direct further research interventions.
Background

Historically artisanal mining has existed in Ghana both as illegal (galamsey) and legal mining operation and is concentrated within the greenstone belts (Birimian and Tarkwaian) and alluvial areas especially along the Offin, Pra, Ankobra and Tano rivers and their tributaries. SAM has attracted global significance because of its potential to contribute to sustainable livelihoods in mining dependent economies, however it brings with it a myriad of occupational health and safety issues pertaining not only to those directly involved the mining process, but also their communities and the surrounding environment. It is estimated Ghana employs approximately 28,000 people for large scale and over 1 million people for SAM. Historically, two main types of SAM activities exist in Ghana:

- Surface Mining
  - Colluvial/eluvial mining using Chinese-made processing equipment known as “Chang Fa”
- Underground Mining
  - Hard rock mining employing largely rudimentary methods of mining popularly called ‘ghettos’. Blasting is common practice in underground mining activities.

The fatality rates in SAM are reported in the literature as up to 90 times that of large scale mining in industrialized countries. The informal and unregulated nature of much ASM activity means it operates outside the scope of legislation or enforcement on health and safety issues; the costs of personal protective equipment (eg helmets and dust masks, machine guarding shields) is extremely high; and there is minimal technical expertise in analysis in underground workings leading to a higher incidence of unpredicted rock falls. Where miners have introduced more-mechanized equipment and techniques, it is not uncommon for safety measures to be overlooked.

Ghana has largely a prescriptive mining legislation process. A significant challenge faced by the Inspectorate is that while some mining undertaken is legal much remains illegal. The situation is further complicated by the presence of foreign miners working within this sector. The Mining Inspectorate has jurisdiction only over legal artisanal miners, that is, those that have a license. Obtaining a license is a complex and costly process and often too expensive for the artisanal miner to afford. Government efforts are being made to formalise the sector, and encourage the formation of co-operatives where multiple miners can work the same site and also benefit from health and safety knowledge and management.
Currently there is a significant focus on the environmental and socioeconomic impacts of SAM, and interventions undertaken by organisations working in this area, with limited research directed to OHS issues in this sector. Most of the available literature is focussed the use of mercury (see side box), the “poverty trap” and negative health impacts of SAM, including substance abuse, alcoholism, gender issues, increased HIV/AIDS and sexually transmitted disease prevalence due to the large predominantly male squatter camps.

The sector is faced with the significant challenge of the continued use of cyanide and mercury in the process of extracting the gold, (both from an individual health and safety perspective and an environmental perspective) and to date most of the OHS focus has been on the use of mercury. The Mercury Abatement Act and Clean Gold projects are working towards the elimination of mercury from the extraction process used by SAM, with NGOs such as Solidaridad and Red Cross working within communities.

To date OHS focussed interventions is negligible in part because of a poor understanding of the sectors dynamics.

**Interviews and Field Visits**

Three site visits were undertaken. Two artisanal mining sites were visited, one legal site in the Central Area and one illegal/legal site in the Western Area of Ghana providing first hand experience of SAM activity. One large mine site in the Western Area was visited.

To better understand the dynamics of the SAM sector, discussions were held with all major stakeholder representatives. Extensive discussions were undertaken with the Minerals Commission Mining Inspectorate; the Ghanaian National Association of Small Scale Mines (GNASSM), the oldest and most recognised body representing artisanal miners in Ghana; and the more recently formed Artisanal Mining Africa Network (AMAN). The Africa Centre for Energy and Policy; the Centre for Social Impact Studies and the Energy Commission of Ghana were also represented in interview. A meeting was held with the Ghanaian University of Mines and Technology (UMaT) to assist in

Mercury is still widely used by the SAM sector to recover free gold from concentrate. During regularisation in 1989, the Mercury Law was amended to allow small-scale gold miners to purchase limited quantities of mercury necessary for their operations, and largely this practice continues. Metal retorts were introduced in 1993, however their use was not widely accepted as it was thought some of the gold remained in the retort, the metal took too much time to heat. More recently a glass retort was introduced, but it is costly, fragile and the due to the smallness of the heating chamber the gold at times get stuck in the chamber. While the glass retort has increased the miners understanding of how it works, mercury remains the most widely used method of free gold recovery amongst small scale and artisanal miners across a number of African countries. The University of Mining and Technology (UMaT) has recently been involved in efforts to product a locally made retort that may be more widely accepted.
understanding their perspective regarding OH&S in the artisanal and small mining sector.

To gain a better understanding of the issues surrounding artisanal and small-scale mining and gather data to inform OHS interventions in this sector, discussions focused on four key areas:

- Identifying the nature and magnitude of the challenges associated with health and safety in the SAM sector
- Gaining an understanding of the appropriate tools and processes required to inform an effective OHS system
- Understanding where to target intervention resources/strategies to have the most impact, and
- Investigating potential ways of conveying information in a form that will be understood by those undertaking SAM practices.

Additionally, short course participants from a number of African countries were interviewed to gain an understanding of SAM and current management strategies within their home countries. In total 20 interviews were undertaken over the two-week period of the visit. A details list of interviewees including their country, work position and seniority appears in appendix 2.

Key Informant Interviews

Inspectorate Division of Minerals Commission

Prior discussion with inspectors from the Minerals Commission of Ghana indicated they would welcome support from MISHC to assist with managing the OH&S challenges they face within the small and artisanal mining sector and helping stabilise the system. While in Accra discussions were held with Chief Inspector of Mines, Mr Michael Bothway; Mr Joseph Frimpong, Senior Inspector of Mines; Mr Isaac Abraham, Senior Public Relations Officer (both of whom were participants in the short course and initiated initial discussion with MISHC Director Professor David Cliff regarding OHS assistance), and Tarkwa District Officer Mr Bern Btibrey to better understand the problems they are encountering and how they see assistance could be provided in this area.

The Mining Inspectorate has jurisdiction only over legal artisanal miners, that is, those that have a license to undertake mining activity. Additionally, the lack of formality in this sector significantly affects worker safety and the ability of the inspectorate to provide assistance to those engaged in SAM activity. During interview the Chief Inspector of Mines commented on the high rate of fatalities in the illegal sector, stating it “was too high to quantify”.

Supporting this comment, in a recent press release the Chief Executive Officer of the Ghana Chamber of Mines indicated 300 people were reported to have died in 2012 from illegal small-scale gold mining activities in Ghana.

Whilst the Inspectorate Division recognises the many issues associated with managing the SAM sector, it is under resourced and experiencing:

- Lack of man power to oversee mining operations and deliver knowledge based courses
- Need for capacity building within the Inspectorate to ensure confidence to deliver and maintain knowledge transfer from senior level to district officer level
- Availability of “local content” relevant resources and training materials.

Assistance requested focussed on capacity building of the inspectorate – to assist in knowledge transfer, and content preparation and delivery of an OHS program targeting senior inspectors and district inspectors (provided in English) who could then deliver the program to district officers within the Inspectorate Division. The Inspectorate is comprised of senior mining inspectors, district mining inspectors (20) and District Officers in 9 Areas. District officers have the skills to deliver the information to the legal mining community (miners and their families) in their local language. An advantage of this model is the “flow on effect” of information as legal and illegal miners live and work in close proximity to each.

The challenges identified by the Inspectorate when dealing with the SAM sector were multi-faceted.

General challenges:

- Largely illiterate and itinerant population
- Poverty and lack of skills to undertake any other income generating activity
- Increase in illegal mining activities in recent times with foreigners involved

Health and Safety challenges:

- Generational involvement in artisanal mining - methods employed are essentially traditional and many consider their way the only way of operating regardless of identified safety issues
- Poor safety management among SAM leading to loss of lives and property
- Improper handling of chemicals, such as mercury which links to water bodies causing both health and environmental hazards
Blasting operations – if an Inspectorate knows blasting is taking place they will arrange supervision but often illegal artisanal miners with no permit will blast hard rock on legal mining concessions.

Policy challenges:

- Sale of mineralized land to illegal miners by some chiefs and landowners in the mining communities
- Lack of mineable land from the Large Scale Mining Companies and delays in licensing process from Environmental Protection Agency – often mining operations will begin illegally and inspectorate cannot stop
- Complexity of process for obtaining a mining license (time and money)
- Environmental issues – dredging of alluvial deposits polluting streams and rivers downstream of operations.

Four key areas were identified by the Inspectorate where targeting of resources and knowledge would have the most impact.

- General mining processes – pit stability, blasting, ventilation, drainage
- Basic health and safety
- PPE
- Environmental issues

These areas align well with the areas of concern raised in interviews with other key stakeholders in the SAM area.

The initial program would be delivered to the Minerals Commission Inspectorate Division.

A possible program format arose from discussions:

- Working with Inspectorate to understand problems/issues from their perspective and gathering visual training materials
- Provide assistance with writing a basic informal knowledge transfer package (similar to “Train the Trainer” to be delivered in English in a 2 week block to Mines Inspectors in each Division (approximate 20 mines inspectors in total).
- Assistance with package delivery: program course delivered in English in three days (Tuesday – Thursday) to include Monday and Friday as travelling days for the Inspectors however these days would be utilised as reflection days to fine tune the package after the first week of delivery). The course would be repeated the following week to the second group of Inspectors.
• Inspectors would then deliver program material to their District Officers (District Officers speak the local languages of the artisanal miners in their area). The information would be tailored to be both site specific and language specific to the local area, with the District Officers assisted in taking this information and appropriate learning materials to the legal artisanal miners in their areas.

• Review and modify as required - ongoing assistance with course delivery as recognised and requested by Inspectorate when delivering course – this may be by internet/Skype/further visit to Ghana.

An outline of a possible program and costing is provided later in this report.

Artisanal Mining Networks
The Ghanaian National Association of Small Scale Miners (GNASSM)
This is the oldest and most recognised organisation representing almost 700 small scale miners in Ghana, and has recently signed a Memorandum of Understanding (MoU) with The University of Technology and Mining (UMaT) to train members of the association in short courses such as surveying, mineral processing, geology, environmental management and land reclamation. The initial focus of the MoU is help promote best mining and processing practices, environmental care and general wellbeing of all stakeholders in the small-scale mining sector, and long term it is envisaged it will enable members of the association to acquire professional training to build their capacity in mining technologies.

Whilst GNASSM represents both small scale and artisanal miners, the MoU is currently directed more toward small-scale than artisanal mining. A spokesman for GNASSM commented that lack of education was a significant contributor to the poor OHS practices of the SAM sector, remarking that

“Just as one of the main reasons mercury is still used is that no immediate effect is seen by miners, so too other OHS practices such as inhaling dust when grinding, are not well understood. Long term and cumulative health effects are generally not able to be related to personally by most engaged in the SAM sector”.

However, he believed that with a better understanding of the risks faced SAM operators would be receptive to making necessary changes to work practices including using PPE. When asked what would best address the OHS needs of the SAM sector he indicated that most engaged in the SAM sector were not educated, advocating:

“a process where a short course program was developed and delivered using local language, that had no academic language and was “all practical”.”
He indicated that help from the Minerals Council and in particular the District Officers would be beneficial to a successful OHS focused program. Environmental concerns and geo-technical mapping of sites were also areas where programs may be helpful. He commented that challenges that may impact on a program included bribery and corruption that were common place.

**Artisanal Mining Africa Network (AMAN)**

Artisanal Mining Africa Network (AMAN) is a recently registered NGO in Ghana with the goal of

> “moving SSM from the uncoordinated largest employment of unskilled labor and fragmented mining into a well organized and efficient mining industry”.

Included in the emerging health and safety related issues facing mining in Ghana it has identified as key issues:

- Accidents and loss of lives, especially in illegal mining areas
- Unsafe handling of chemicals especially mercury and cyanide

As part of a way forward AMAN advocates:

- Ring fencing areas for SSM
- Formalising illegal SSM activities in designated areas and form cooperatives and associations
- Providing support with equipment and working capital
- Capacity building
- Developing guidelines for SSM in Ghana
- Encouraging education in the mining areas
- Strengthening capacity of officers to monitor SSM activities as well as enforce provisions in the Act and legislations.

AMAN is working in cooperation with the Minerals Commission of Ghana and other stakeholders for the formation of the Chamber of Small Scale Miners in Ghana and it was indicated the association would welcome assistance to build the capacity of the Mining Inspectorate in the area of SAM management.
University of Mining and Technology (UMaT)

An invitation was accepted from Professor Newton Amegbey (Dean, Faculty of Mineral Resources and Technology) to visit the University of Mining and Technology (UMaT) in Tarkwa to discuss the teaching program offered by UMaT and the recent signing of a MoU between the University and The Ghanaian Small Scale and Artisanal Mining Association (GNASSM).

This visit was to commence building links between Universities, and to better understand the Ghanaian situation regarding OH&S in the artisanal and small mining sector. Professor Amegbey indicated UMaT would be interested developing a partnership between the two Universities. Strengthening these links may provide a base and a means for future delivery of an OH&S program targeted to issues relevant to small and large scale sectors of the mining industry, and provide future research collaboration partnerships between the two Universities.

As mentioned previously, UMaT is in discussion with representatives of the GNASSM and AMAN and has signed an MoU to train members of the association in short courses and help promote best mining and processing practices, environmental care and general wellbeing of all stakeholders in the small-scale mining sector. Long term it is envisaged it will enable members of the association to acquire professional training to build their capacity in mining technologies.

These courses are focused on small-scale mining and beyond the level of knowledge of both legal and illegal artisanal miners. Discussions with representatives from the Minerals Commission indicated they considered this “formal” training, and the process the Inspectorate indicated would work best was an “informal” knowledge transfer process within the Inspectorate and then between the Inspectorate and the SAM sector.

Government Representatives

It would appear from discussions, that many Government representatives with a background in policy and planning consider SAM activities in Ghana to be largely a marginalised economic industry, without the level of government support Small Scale mining activity enjoys. Problems identified were similar to those identified by the mining inspectorate, however, solutions became complex as illegal and legal mining activities mixed across sites, and community involvement was highlighted as imperative to success of any program implemented. Again a program similar to that outlined by the inspectorate was envisaged, with capacity building and training in OHS hazard identification and strategies to manage site-specific hazards. Generally it was considered essential to involve the affected communities, SAM operators, large scale mining operations and the Minerals Commission as the regulatory body overseeing the program.
Africa—Australia Short course participants
Most participants in the Africa-Australia Short Course OHS Group were familiar with issues surrounding SAM in their home countries and were willing to share experiences. All countries face similar mercury and OHS related issues, children and women on mine sites, poverty and environmental problems. For most countries, SAM opens opportunities to work in the face of high unemployment however bribery and Chiefdom payment often confound the licensing process.

As an example, in an attempt to better manage SAM activity, Sierra Leone has restricted artisanal mining to a depth 10 metres where rudimentary equipment may be safely used, minimally invasive mining methods are employed, and the license is restricted to 50 persons. The site is GPS surveyed, and the license is valid for 3 years with only two renewal periods. The Inspectorate closely monitors activity and failure to meet OHS requirements allows closure of the site. SSM is restricted to 50 metres in depth, with deeper deposits being the domain of large scale mining activities. Mozambique, which has gemstone as well as gold mining reports OHS issues similar to Ghana, with a major cause of injury being slope or pit instability with no planning in place prior to digging. The Inspectorate has embarked on a program of training of safe mining practices, where mining is restricted to a depth of 15 metres, no machinery is allowed, and an NGO is attempting to provide appropriate PPE.

The Kenyan Mining Inspectorate was assisted with Government and NGO (Solidaridad) funding between 2005 and 2012 to develop a program to assist SAM operators. Funding has now been withdrawn however the program continues in a reduced capacity. Target areas were similar to those discussed with the Inspectorate in Ghana, and would it be beneficial to discuss key learnings and program detail in greater depth when developing the program for delivery by the Ghana Inspectorate.

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**Government Initiatives focused on improving small scale mining practices:**

- Policy initiatives to ensure geological data on all minerals amenable to small-scale mining is available to prospective miners
- The creation of 9 District Mining Offices of the Mineral Commission to facilitate licensing and monitoring of SAM
- The restructuring of the license fee structure to make it easier for Ghanaians to secure mining rights
- Blocking out areas for SAM and geologically mapping these areas
- Formation of SAM Associations
- Development of a strategic framework to address the challenges in the SAM sector
- Inauguration of an inter ministerial task force – to curb illegal mining
- Financial assistance to SAM co-operatives
- Sensitisation and Education programs
- EU supported Mercury Pollution Abatement project in conjunction with the UNIDO project
- Gold Buying Companies and Value Addition Efforts
Activity Report

Mercury is still used by artisanal miners (both legal and galamsey) to amalgamate the gold. Using the palm of the hand, the lighter weight gold is bound together. Taking about an hour to complete, no gloves are worn. When asked why, the reply was: “here is no information that says using mercury affects our health”.

As a precautionary measure hands are washed with soap after completing the procedure. The mercury is then burned – mostly this operation has been moved away from inside the home to outside, but how far away from the house was a safe distance was explained as “depending on how hot the fire heat was”. It was not believed any vapour was released in the process.

Mercury is purchased at the markets, but country of origin is uncertain. $US30 will buy around 54.410g of mercury which yields approximately 8lbs of gold. Legally, residual mercury is not to be reused, but the reality of this practice is uncertain. Programs such as Mercury Free Gold and Clean Gold, the Mercury Abatement Program and the development of locally produced retorts are working towards eliminating this practice.

Current Government Interventions

The Government of Ghana has recognised that while small-scale mining operations undertaken in the country offer opportunities to support rural livelihoods, develop entrepreneurship and provide a source of raw materials for industry, the sector requires assistance in operating sustainably both economically and environmentally. The Minerals Commission is working closely with Government agencies in designing and implementing a range of measures aimed at improving SAM (See side box).

A key strategy of this framework is the development of guidelines on Health and Safety and training of SSMs in the use of environmentally friendly processing methods. The program discussed with the Mining Inspectorate sits well within the strategic framework, and also aligns well with strategies identified for SAM management in the Africa Mining Vision 2008.

Site Visits

Three site visits were undertaken while in Ghana. Two artisanal mining sites were visited, one legal site in the Central Area and one illegal site in the Western Area of Ghana. One was a very small site operated as a co-operative, the lease being individually owned, the other again individually owned but with illegal SAM activity. At both sites rudimentary equipment was used to dig, wash and sieve the gold powder; petrol powered generators, compressors and pumps were in use and PPE was not seen to be used. One large-scale mining site owned by GoldFields was visited.
**Site 1. Artisanal mine site – Central Region**

This was a small site, with the lease individually owned. Gold extraction was labour intensive, with the site spokesperson (son of the lease owner) indicating approximately 3 weeks work was needed to gather around 10 drums of earth and stones. Sieved and passed across washing boards finally about a bowl of gold powder and dirt was extracted from original digging (see images in sidebox). Mercury is used in the amalgamation process (see side bar). Acid is sometimes added to the mix to increase the quality of the gold end product. Miners are most often paid fortnightly for their work, although some are paid daily. With payment linked to current gold price, wage fluctuations, but average about $US10 (20 Ghana cedis) per day for 7 hours work. Individuals are able to sell their gold to sponsors, however, as part of the licensing agreement lease-holders must sell their gold to the Government and submit records to the Minerals Commission. Leaseholders pay taxes to the Government whereas artisanal miners pay no tax, but do make payment to the lease owner.

The machinery on site was mainly **Chang Fa** or Chinese and mostly generators, compressors, and pumps, and one small excavator. The spokesman indicated machinery was readily available as companies such as GhanaGold left the area to focus on oil exploration activities, but expensive to purchase. He commented the machinery was dangerous and miners sustained both injury and loss of limb while operating it because they didn’t know how to use it properly. No PPE was seen in use on the site whether miners were working or repairing machines (image 4). One young miner was seen attempting to repair a damaged motor whilst it was still operating, and another was observed with mud splashes across his face, including his eyes, nose and lips (image10). Heavy manual tasks including shovelling and lifting were common practice on site (images 1, 3,7,9, and 11). It was indicated that when PPE was provided most often it was either destroyed or only worn when the miners knew Inspectors were coming on site, however when questioned further it was agreed that if miners knew why they had to wear PPE and the Mines Inspectors enforced it then they would wear PPE while working. He was unable to comment on how much PPE was available for use or whether wearing it was enforced on site. No OHS training had been given to the SAM operators regarding tools and techniques used. The site was visited on a Sunday and women and children were present and working on site. With average earnings of around $US10 per day – most would be used to pay school fees. Usually women, and children under the age of 18 are not allowed on the site, and generally children are not encouraged to come on site as a disincentive to dropping out of school. Typically, women work on site as food vendors, selling water and food to the miners. The spokesman indicated the mine-site had good relations with the local community as they had paid money to the local chiefs for the land, and had provided electricity to the village.
Images 1 - 3: Using rudimentary equipment to mine.

Image 4: Repairing equipment with no PPE

Image 5: Children working on the site

Image 7: Working on site

Image 8: Chang Fa or Chinese equipment
Site 2. Artisanal mine site - Western Region

A larger site was visited in the Wasa region. This site was interesting as mining was illegal but conducted on a registered mine site lease, and the lease owner had provided assistance with equipment to dig the site to provide some level of OHS site management. Similar to the previous site, Chang Fa machinery such as compressors, generators and pumps were used. No PPE appeared to be worn and women were working alongside men on the site (images 12-18). Not as much information was available on the management of this site however the impression gained was that SAM operators could sell their gold to sponsors who then on-sold to other buyers. As with the previous site visit, this visit confirmed those operating in the SAM sector are exposed known dangers in the workplace that to date have not been well addressed including lack of training, poor ventilation, lack of safety equipment, improper use of chemicals, and obsolete equipment, as well as other occupational health problems including silicosis, noise-induced hearing loss and muscular strains from heavy lifting.
Image 12: Chang Fa equipment

Image 13: Artisanal site – Wasa District

Image 14: Artisanal mining – Wasa District

Image 15: Environmental damage from artisanal mining

Image 16: Equipment used in process of artisanal mining

Image 17: Children working on site

Image 18: Working on site — no PPE
Site 3. Large scale mining site - Western Region

The Goldfields Ghana Limited mine site at Tarkwa was visited. Illegal SAM exists throughout the area with many techniques used by the miners impacting on water quality yet much of the blame for water contamination reportedly placed on the larger mining activity. This was a low-grade ore site therefore unattractive to illegal miners, but high-grade ore areas commonly attract illegal activity before the company is aware of their presence. Often company practice is to give these miners a month to mine the area and then leave. It is not uncommon to find illegal miners accessing the pits and shafts of legal mining operations jeopardising not only the safety of the illegal miners but also the large scale mine employees. Past practices have included sectioning off parts of the large mine site for SAM operations but frequently SAM operations encroach on the large scale mining operations creating tension and adverse community relations between large mine operators and the SAM community. Many are foreign miners (mostly Chinese), and the Government has initiated action aimed at flushing out foreign miners. One of the problems highlighted was that wherever Chinese were, consequentially the area experienced a high crime rate.

Follow up activity and other opportunities

Largely with the exception of mercury handling, OHS focussed interventions in the SAM sector is negligible. This in part is because of a poor understanding of the sectors dynamics. This pilot study has confirmed other known dangers in the workplace that to date have not been well addressed including lack of training, poor ventilation, lack of safety equipment, improper use of chemicals, and obsolete equipment, as well as other occupational health problems including silicosis, noise-induced hearing loss and muscular strains from heavy lifting.

Through this pilot project a better understanding of the issues surrounding artisanal and small-scale mining has been gained and significant data has been gathered to inform OHS interventions in this sector. It has:

- Identified the nature and magnitude of the challenges associated with health and safety in the SAM sector
- Provided an understanding of the appropriate tools and processes required to inform an effective OHS system
- Provided an understanding of where to target intervention resources/strategies to have the most impact, and
- Investigated potential ways of conveying information in a form that will be understood by those undertaking SAM practices.
In moving forward, it is recommended Minerals Industry Safety and Health Centre (MISHC) works closely with the Mining Inspectorate in Ghana to develop an OHS short program focussed on building the capacity of the inspectorate in terms of managing the OHS risks identified in the site visits undertaken and confirmed in discussions with many of the stakeholders in the artisanal sector.

The Ghana Chief Inspector of Mines and Senior Mines Inspectors identified the following areas as high priority:

- Basic Mining Processes including digging, general mine site safety procedures, pit construction, scaffolding, collapse, ventilation
- Safe Working Practices – occupational hygiene including dust, PPE, manual tasks
- Taking Care of Themselves- a basic understanding of the health issues associated with artisanal mining, including short and long term health effects
- Basic environmental concerns and safety procedures to reduce environmental impact at an individual level

Essentially the program needs to be specific to artisanal mining needs and not small scale mining. It needs to be simple and clear, and address the major hazards identified by the inspectorate, while being user-friendly, streamlined and in informal language appropriate for artisanal workers.

It is envisaged the initial program would be developed in Brisbane and in close consultation with the Ghana Mines Inspectorate, with input from the Queensland Mines Inspectorate (and possibly the NSW Mines Inspectorate). Both departments have extensive small mines programs with information available that will assist in informing package content (see appendix 5 for further information). It would be delivered in Ghana with assistance from Ghanaian Senior Mining Inspectors to Mining Inspectors based throughout the Ghana mining area (20 Inspectors in total).

The Mining Inspectors would then work with District Officers throughout the regions (District Officers speak the local languages of the artisanal miners in their area). The information would be tailored to be both site specific and language specific to the local area. District Officers would assisted by Inspectors in taking the information and appropriate learning materials to the legal artisanal miners in their areas. It is envisaged the information delivered will “filter through” to illegal miners working in the same areas - as many have close relationships with the legal artisanal miners in their community.

It is envisaged the Minerals Commission Mining Inspectorate will be able to provide the venue for the program and fund costs incurred in Inspectorate personnel attending the program.
## Capacity Building Knowledge Transfer Package

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare package outline</td>
<td>Investigate currently available resources and prepare training package outline. Develop a basic informal knowledge transfer package (similar to “Train the Trainer”) To be delivered in English in a 2-week block to Mines Inspectors in each Division (approximate 20 mines inspectors in total). Develop training materials in conjunction with Ghana Mines Inspectorate staff.</td>
<td>4 weeks (based in Brisbane)</td>
</tr>
<tr>
<td>Work with Inspectorate</td>
<td>Obtain Video and Still footage Incorporate into learning materials Fine tune package delivery. Refine training package once visual materials have been prepared. Fine tune and print visual training materials</td>
<td>Field work - 2 weeks (based in Ghana with visits to mine sites to observe and prepare visual learning materials)</td>
</tr>
<tr>
<td>Package Delivery</td>
<td>Program delivered in English in three days (Tuesday – Thursday) with Monday and Friday as travelling days for the Inspectors. Program repeated the following week to the second group of Inspectors (Monday and Friday allow for fine tuning of program following initial delivery).</td>
<td>2 weeks based in Tarkwa – Western District Ghana</td>
</tr>
<tr>
<td>Re-evaluation of program and review as required</td>
<td></td>
<td>1 week – Brisbane (commenced in Ghana during course deliver)</td>
</tr>
<tr>
<td>Ongoing assistance with subsequent course delivery to SAM</td>
<td></td>
<td>Skype/Internet/may include further visit to Ghana if indicated</td>
</tr>
</tbody>
</table>
# IM4DC Budget Estimate

## Estimates:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personnel - Danellie Lynas</strong></td>
<td><strong>Brisbane:</strong> Background research and preparation of learning materials across 4 identified areas/modules - Brisbane (5 days per module = 20 days @ $1250/day) <strong>Ghana:</strong> Working with Inspectorate on field observation to identify site specific issues relating to SAM; obtain video and still footage and prepare for use in course presentation; complete course including site specific examples, and work with Inspectorate on delivery mechanism (10 days @ $1250/day) Delivery of course content – (course delivered twice – 5 days per course including travel time and amendment of materials) (10 days @ $1250/day)</td>
<td><strong>$25,000</strong></td>
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<tr>
<td><strong>Flights - Danellie Lynas</strong></td>
<td>Return flights Brisbane - Ghana</td>
<td><strong>$10,800</strong></td>
</tr>
<tr>
<td></td>
<td>Accommodation, meals and incidents (estimated @ $200/day x 4 weeks)</td>
<td><strong>$5,600</strong></td>
</tr>
<tr>
<td></td>
<td>Transport Accra – Tarkwa/Busua - Accra</td>
<td><strong>$600</strong></td>
</tr>
<tr>
<td><strong>(Kylie Pettitt) Assistance with preparation and printing of course materials</strong></td>
<td>Description Design and preparation of course materials/manuals in Brisbane (slides/workbooks/DVD) (5 days @ $830/day) Printing of material in Brisbane (20 Mines Inspectors per course) @ $26/copy</td>
<td><strong>$4,150</strong></td>
</tr>
<tr>
<td><strong>GST</strong></td>
<td></td>
<td>GST not included</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>$71,710 approx</strong></td>
</tr>
</tbody>
</table>

Calculation is based on only one person spending 4 weeks in Ghana.

Does not include any time/travel allocation if DNRM inspector included in field work.

**Options:**

1. Develop the Ghana field component of the course in late March when Carmel Bofinger will already be in Africa and could travel to Ghana. This would decrease flight costs.

2. Engage the services of Isaac Mate (PhD student of Prof David Cliff currently associated with UMaT & previously VP Health, Safety and Environment AngloGold Ashanti) based in Ghana. This option would mean flights and some accommodation in Ghana would not be required. Approximate cost to engage - $10,000.
Appendices

Appendix 1: Key Information Persons

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Organisation</th>
<th>Country</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Michael K Botchway</td>
<td>Chief Inspector of Mines, Inspectorate Division, Minerals Commission of Ghana</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>2</td>
<td>Joseph Frimpong</td>
<td>Senior Inspector of Mines, Inspectorate Division, Minerals Commission of Ghana</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>3</td>
<td>Isaac Kojo Abraham</td>
<td>Senior Public Relation Officer, Inspectorate Division, Minerals Commission of Ghana</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>4</td>
<td>Bernard K. Ntibrey</td>
<td>District Officer (Tarkwa), Inspectorate Division, Minerals Commission of Ghana</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>5</td>
<td>Professor Newton Amegbey, PhD</td>
<td>Dean, Faculty of Minerals Resources Technology, University of Mines and Technology, Tarkwa</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>6</td>
<td>John-Peter Amewu</td>
<td>Director Policy and Research, Africa Centre for Energy and Policy, Accra, Ghana</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>7</td>
<td>Eric Ofori-Nyarko</td>
<td>Deputy Director/Head of Social and Environmental Impact and Technology Assessment Division of the Energy Commission, Accra, Ghana</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>8</td>
<td>Richard Ellimah</td>
<td>Manager, Centre for Social Impact Studies, Obuesi, Central Ghana</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>9</td>
<td>Isaac Mate</td>
<td>VP Health, Safety and Environment AngloGold Ashanti - Ghana</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>10</td>
<td>Eric Coffie Rivers</td>
<td>President of the Artisanal Mining-Africa Network (AMAN) Ghana</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>11</td>
<td>Emmanuel Dziebel</td>
<td>President Ghana National Association of Small Scale Miners, Ghana</td>
<td>Ghana</td>
<td>M</td>
</tr>
<tr>
<td>#</td>
<td>Name</td>
<td>Organisation</td>
<td>Country</td>
<td>Gender</td>
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</tr>
<tr>
<td>12</td>
<td>Wilson Mujovo</td>
<td>Senior Technician, National Directorate of Geology, Mozambique</td>
<td>Mozambique</td>
<td>M</td>
</tr>
<tr>
<td>13</td>
<td>Ada Kanon Ghislain</td>
<td>Mining Technic Engineer, Ministry of Mining, Petroleum and Energy, Cote d'Ivoire</td>
<td>Cote d'Ivoire</td>
<td>M</td>
</tr>
<tr>
<td>14</td>
<td>Fullah Alhassan Sahied Shabab</td>
<td>Government Mining Engineer, Ministry of Mines and Mineral Resources</td>
<td>Sierra Leone</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Edward Bendu</td>
<td>Senior Environment Officer, Environment Protection Department, Ministry of Lands, Country Planning and the Environment, Sierra Leone</td>
<td>Sierra Leone</td>
<td>M</td>
</tr>
<tr>
<td>17</td>
<td>Caramon Gnemessammam Nagazama</td>
<td>Chief of the Division “Mining Inspection”, Head Office of Mines and Geology, Togo</td>
<td>Togo</td>
<td>M</td>
</tr>
<tr>
<td>18</td>
<td>Nnamdi C Anene</td>
<td>Senior Geologist, Artisanal and Small Scale Mining Department, Ministry of Mines and Steel Development, Aduja, Nigeria</td>
<td>Nigeria</td>
<td>M</td>
</tr>
<tr>
<td>19</td>
<td>Ibrahim Isyaku</td>
<td>Senior Environmental Officer, Federal Ministry of Mines and Steel Development, Aduja, Nigeria</td>
<td>Nigeria</td>
<td>M</td>
</tr>
<tr>
<td>20</td>
<td>Solomon Negussie</td>
<td>Senior Gender Expert, Ministry of Mines</td>
<td>Ethiopia</td>
<td>M</td>
</tr>
<tr>
<td>21</td>
<td>Melkamu Merine</td>
<td>Acting Director Environment and Community Development, Ministry of Mines, Ethiopia</td>
<td>Ethiopia</td>
<td>M</td>
</tr>
</tbody>
</table>
Appendix 2: Linkages Established

1. Minerals Commission Inspectorate Division (Accra):
   - Mr Michael K Botchway - Chief Inspector of Mines
   - Mr Joseph Frimpong - Senior Inspector of Mines
   - Mr Bernard K. Ntibrey - Western District Officer (Tarkwa)
   - Mr Isaac Abraham - Senior Public Relations Officer

2. University of Mining and Technology (UMaT):
   - Professor Newton Amegbey PhD – Dean, Faculty of Minerals Resource Technology

   - Mr Emmanuel Dzeble – Administrator

4. Artisanal Mining Africa Network (AMAN):
   - Mr Eric Coffie Rivers (President)
   - Mr Peter John Amewu (Board Member) and Director Policy and Research, Africa Centre for Energy and Policy, Accra, Ghana

5. Centre for Social Impact Studies, Obuesi, Central Ghana:
   - Mr Richard Ellimah – Manager

6. Energy Commission of Ghana:
   - Social and Environmental Impact and Technology Assessment Division
     Mr Eric Ofori-Nyarko - Deputy Director/Head of Social and Environmental Impact and Technology Assessment Division

7. Mr Isaac Mate – PhD candidate MISHC and ex VP Health, Safety and Environment, AngloAshantiGold, based in Accra Ghana, and currently working with UMaT.
#Appendix 3: Travel Diary

<table>
<thead>
<tr>
<th>Date of Activity</th>
<th>Location of Activity</th>
<th>Brief Details of Activity</th>
<th>Time of Activity</th>
<th>Date of Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/10/2013</td>
<td>In transit</td>
<td>Flight from Brisbane to Dubai (3.5 hr delay at airport)</td>
<td>2345 1045</td>
<td>14/10/2013</td>
</tr>
<tr>
<td>12-13/10/2013</td>
<td>In transit</td>
<td>Plane delay caused Dubai flight connection to be missed – wait listed next day but flight full resulting in 2 days stop in Dubai Luggage lost en route to Dubai</td>
<td>1045 12/10/13 2400</td>
<td>14/10/2013</td>
</tr>
<tr>
<td>14/10/2013</td>
<td>Accra</td>
<td>Filling in forms re lost luggage Flight Dubai to Accra, Ghana Sit in on OHS short course session and meet participants/discuss involvement in artisanal mining</td>
<td>0430 0740 1500 06.30 1300 1700</td>
<td>14/10/2013</td>
</tr>
<tr>
<td>15/10/2013</td>
<td>Accra</td>
<td>Interviews with OHS course participants/and artisanal mining representatives. Meeting with Mr Eric Ofori-Nyarko, Mr Richard Ellimah, Mr Eric Coffie Rivers.</td>
<td>0900 1600</td>
<td>15/10/2013</td>
</tr>
<tr>
<td>16-17/10/2013</td>
<td>Volta River</td>
<td>Field trip to Volta River Power Station &amp; commenced interviews with course participants</td>
<td>08:00 17:30</td>
<td>17/10/2013</td>
</tr>
<tr>
<td>18/10/2013</td>
<td>In transit</td>
<td>Travel back to Accra Meeting with Mr JP Amewu - Director of Policy &amp; Research, Africa Centre for Energy Policy</td>
<td>08:00 13:30</td>
<td>18/10/2013</td>
</tr>
<tr>
<td>19/10/2013</td>
<td>Accra</td>
<td>Interviews with course participants/artisanal mining representatives</td>
<td>1100 1500</td>
<td>19/10/2013</td>
</tr>
<tr>
<td>20/10/2013</td>
<td>Busua Beach</td>
<td>Bus travel to Busua Beach including visit to artisanal mine enroute</td>
<td>0830 1700</td>
<td>20/10/2013</td>
</tr>
<tr>
<td>21/10/2013</td>
<td>Busua Beach</td>
<td>Visit to large minesite (GoldFields) Visit to UMaT to meet Prof Newton Amegbey regarding artisanal mining OHS initiatives</td>
<td>0830 1400 1300 1630</td>
<td>21/10/2013</td>
</tr>
<tr>
<td>22/10/2013</td>
<td>Busua Beach</td>
<td>Field trip to artisanal minesite</td>
<td>0600 1800</td>
<td>22/10/2013</td>
</tr>
<tr>
<td>23/10/2013</td>
<td>Busua Beach/In transit</td>
<td>Meeting with Mr Bern Ntibrey District Officer Mines Inspectorate (Western region) and Isaac Abraham (Senior public relation officer Inspectorate Division) Bus travel to Accra</td>
<td>1000 1200 1200 1900</td>
<td>23/10/2013</td>
</tr>
<tr>
<td>Date of Activity</td>
<td>Location of Activity</td>
<td>Brief Details of Activity</td>
<td>Time of Activity</td>
<td>Date of Entry</td>
</tr>
<tr>
<td>------------------</td>
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<td>--------------</td>
</tr>
<tr>
<td>24/10/2013</td>
<td>Accra</td>
<td>Interviews with Course participants (OHS &amp; CCR)</td>
<td>0900 – 1500</td>
<td>24/10/2013</td>
</tr>
<tr>
<td>25/10/2013</td>
<td>Accra</td>
<td>Meeting with Mr Michael Botchway - Chief Inspector of Mines and Mr Joseph Frimpong Senior Inspector of Mines</td>
<td>1400 – 1750</td>
<td>25/10/2013</td>
</tr>
<tr>
<td>26/10/2013</td>
<td>Accra</td>
<td>Meeting with Mr Isaac Mate regarding artisanal mining OHS issues</td>
<td>0900 – 1730 26/10/13</td>
<td>28/10/2013</td>
</tr>
<tr>
<td></td>
<td>In transit</td>
<td>Flight Accra to Dubai</td>
<td>0900 – 1730 26/10/13</td>
<td>28/10/2013</td>
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<tr>
<td>27/10/2013</td>
<td>In transit</td>
<td>In transit Dubai to Brisbane</td>
<td>1020 27/10/13</td>
<td>28/10/2013</td>
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</tbody>
</table>
Appendix 5: Materials currently available to assist program preparation

Queensland Government - Department of Natural Resources and Mining

- DNRM – Small Scale Mining Code
- DNRM- Mining claims handbook – General Information
- Additional information on request

NSW Government - Trade & Investment Resources & Energy

- Lightning Ridge Opal Mining Review Report
- NSW DMR Small Mines Risk Assessment (Parts 1, 2 & 3)
- NSW DPI Small Mines Pocket Cards.pdf
- NSW DPI Small Mines Pocket Guide.pdf
- NSW Small Mines Safety Kit.pdf
- Small Mines Safety Management Kit Body (Parts 1 & 2)
- Small Mines Safety Management Kit Intro (Parts 1 & 2)
- Additional information on request