

Communities and Small-Scale Mining (CASM) Initiative

**COMMUNITIES AND SMALL-SCALE MINING:
AN INTEGRATED REVIEW FOR DEVELOPMENT PLANNING**



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Cover Photos (*clockwise from top*):

Ghaniain Women Miner and Child (C. Beinhoff), Mercury-Gold Amalgam (AJ Gunson), Child Gold Mining in the Philippines (N. Jennings), Karimajong Women Marble Miners (R. Gaucher), Chinese Miners Testing a Knelson Concentrator (AJ Gunson), Gemstone Miners in Sri Lanka (J. Hinton).

FOREWORD

This book represents a first attempt to synthesize and distill the essential lessons and new directions suggested by the experience and knowledge shared and debated at the Communities and Small-Scale Mining (CASM) Annual General Meetings (AGM) over the past three years. It was prepared on CASM's behalf by Jennifer Hinton, a brilliant and tremendously committed member of the ASM community, who has participated in all three of the past AGM and Learning Events

CASM was created in March 2001. Since then, CASM held three AGMs . They have been more than just business meetings; purposefully set up as Learning Events designed to provide a regular formal venue for promoting knowledge exchange, skills acquisition, and constructive dialogue among a wide range of actors, including mining affected communities and the artisanal and small scale miners themselves. Each Learning Event has had a particular thematic focus, building on the results and recommendations of preceding meetings, while drawing on the experience and successes of each host location:

- 1st AGM - London, U.K., March 2001: establishment of CASM, from a Cooperative Group to a "Communities and Small-scale Mining" initiative.
- 2nd AGM – Ica, Peru: Formalization of Artisanal and Small-scale Mining – the Peruvian Experience.
- 3rd AGM – Elmina, Ghana: 15 Years of ASM Reform in Ghana – Experiences and Lessons.
- 4th AGM – Colombo, Sri Lanka: Gemstones in Sri Lanka: From Mines to Markets.

Oftentimes, when such meetings are held and the inputs reported, little effort is made to evaluate what has been learned and determine what it all means for improving the effectiveness of policies, interventions and on-the-ground assistance. There is value in reflecting from time to time and assessing where we have been and where we must go to derive the maximum benefit from all of our efforts and commitment.

ASM is by no means a homogeneous phenomenon. It is carried out within an array of complex circumstances and realities. The Learning Events have tried to reflect this diversity, as well as the associated challenges and opportunities faced by mining communities and governments. Each Learning Event has served as a vehicle for highlighting different initiatives being undertaken at local, regional and international levels, and their results. The meetings have also provided a neutral and supportive environment for voices and views that might otherwise not be heard. They have allowed individual participants the chance to share experience and perspectives, to stimulate new thinking, and deepen their understanding of challenges in ways that can be valorized in their own work at home. Since inception, the CASM AGM and Learning Events have been the cornerstone of a global knowledge sharing and networking strategy.

As part of CASM's own commitment to ramp up its efforts and follow through on recommendation made at the various AGMs, the Secretariat organized last June a major conclave in Washington, which turned the traditional ASM paradigm upside down. Discussions focused on the global development agenda and how work with ASM can contribute to the achievement of key Millenium Development Goals. At the next AGM in Salvador de Bahia, this discussion will be further developed and extended. We hope that this review can serve as a useful perspective on how far our thinking has developed and how much further we have yet to go.

CASM Secretariat, Washington D.C., September 25th 2005

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ACRONYMS

AGM	Annual General Meeting
AFWMN	African Women in Mining Network
AMREF	African Medical and Research Foundation
APPELL	Awareness and Preparedness for Emergencies at the Local Level
ASM	Artisanal and small-scale mining
CAR	Central African Republic
CASM	Communities and Small-scale Mining Initiative
CBO	Community-based Organization
CDD	Community-Driven Development
CGAP	Consultative Group to Assist the Poorest
CYTED	Latin American Programme of Science and Technology for Development
DFID	Department for International Development
DRC	Democratic Republic of Congo
EAG	Expert Advisory Group
EIR	Extractive Industries Review
FDI	Foreign direct investment
GDP	Gross domestic product
GMP	Global Mercury Project
HIPC	Highly-Indebted Poor Countries
IDRC	International Development Research Centre of Canada
ILO	International Labour Organization
IPEC	International Programme for the Elimination of Child Labour
MDG	Millennium Development Goals
MMSD	Mining, Minerals and Sustainable Development
MSDP	Mining Sector Diversification Programme
NGO	Non-governmental organization
OECD	Organization for Economic Cooperation and Development
SAWIMA	South African Women in Mining Association
SLA	Sustainable Livelihoods Approach
SMAG	Strategic Management Advisory Group
UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
WCED	World Commission on Environment and Development
WHO	World Health Organization
WSSD	World Summit on Sustainable Development

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Communities and Small Scale Mining: An Integrated Review For Development Planning

1 INTRODUCTION

Environmental devastation, perilous work practices, pervasive poverty, HIV/AIDS, deplorable infrastructure, child labour and scant social services – these are a few descriptors of conditions in artisanal and small-scale mining (ASM) communities¹ in more than 55 mainly developing countries throughout the world. Despite this reality, ASM provides an important source of livelihood, particularly in regions where economic alternatives are critically limited. In addition to rural employment, ASM contributes to foreign exchange earnings, reduces rural-urban migration and enables exploitation of deposits which are unattractive to formal mining companies. To some, participation is driven by the allure of riches; however, for most, ASM signifies an opportunity to relieve the strains of poverty.

As long as poverty persists, ASM is fated to continue in developing regions throughout the world. In 1999, the International Labour Organization (ILO) estimated that the number of artisanal miners was around 11-13 million in 55 countries, a 20% increase over the previous decade. From this, it was extrapolated that 80 - 100 million people worldwide were directly and indirectly reliant on this activity. With escalating poverty due to factors including drought and conflict causing displacement of populations and diseases such as HIV/AIDS, together with the attraction of potential wealth due to rising commodity prices, the number of artisanal and small-scale miners continues to escalate.

The critical challenge for those working in and with the ASM sector is to mitigate the negative consequences and enhance the positive benefits in order to transform ASM into an activity which reduces poverty by supporting integrated sustainable development of impacted communities. The Communities and Small-Scale Mining (CASM) Initiative – along with international agencies, governments, non-governmental organizations (NGOs), miners and their communities – are actively seeking to advance positive change in this direction.

1.1 CASM – Past, Present and Future

The Communities and Small-Scale Mining (CASM) initiative was launched in March 2001 in response to a series of international meetings that identified a critical need for integrated, multi-disciplinary solutions to the complex social and environmental challenges facing ASM communities and improved coordination between the various institutions working in this sector.

During its inaugural meeting held on March 27 and 28, 2001, in London, CASM was conceptualized as a multi-donor networking and coordination facility whose mission is to “*reduce poverty by improving the environmental, social and economic performance of artisanal and small-scale mining in developing countries*” (CASM, 2001). At this event, a core group of sponsors including DFID, the World Bank, the ILO, UN, French and Japanese institutions made a

¹ Although “ASM communities” may be reliant on a number of economic activities (e.g. agriculture), this term is loosely applied to communities where ASM is a component of the local economy.

commitment in principle to supporting CASM and other agencies were subsequently invited to collaborate. Initially conceived as the Collaborative Group for Artisanal and Small Scale Mining (CASM), the CASM Charter was adopted during this meeting. The charter outlined that CASM would achieve its mission by:

- Mitigating or eliminating the negative environmental, social and cultural effects of artisanal and small-scale mining on affected communities;
- Reducing the occupational health and safety risks to miners;
- Improving the policy environment and institutional arrangements governing small-scale mining;
- Increasing the productivity and improving the livelihoods of miners; and
- Working to advance alternative livelihoods through effective use of their natural resource capital, in part, by conservation of biodiversity in affected areas.

CASM continues to further these goals through its efforts to create a knowledge-based community and strong network of miners, communities, government officials, donors, development agencies and non-profit organizations that are involved in the sector. Through sharing the accumulated wisdom and experience of the last decade, the CASM network seeks to ensure that past mistakes are not repeated, proven approaches and techniques are not re-invented and research efforts are not re-done. CASM also directly supports and promotes the development of projects and approaches by individuals, communities and institutions that will directly or indirectly contribute to the reduction of poverty and the advancement of more viable livelihoods in regions where ASM is an important activity.

Some of the critical needs for which adequate responses have yet to be identified and mainstreamed include: formalization and organization of small-scale miners; empowerment of women; environmental and human health issues, including HIV/AIDS and occupational hazards; the elimination of child labour; improving transparency and governance; the re-conceptualization of small-scale mining as a non-farm income generating activity; and, its effective integration into the rural economy.

In order to address these crucial issues, CASM has organized Annual General Meetings (AGMs) in Peru (2002), Ghana (2003) and Sri Lanka (2004) and numerous Learning Events on a number of key themes. As well, CASM supported a ground-breaking conference on the "Millennium Development Goals and Small Scale Mining" (2005) in Washington DC. These events have brought together small-scale mining experts, government and non-governmental representatives, academics, and miners in order to share knowledge and identify solutions.

The initial CASM AGM in Ica, Peru sought to underscore the relationship between miners, governments and NGOs and to characterize contemporary beliefs on how ASM should be addressed, specifically in relation to sustainable livelihoods and community development. Specific themes addressed: the formalization experience in Peru; the roles of academics, NGOs and governments; social challenges in ASM communities (including child labour

and community building processes); and the contribution of ASM to sustainable development. AGM workshops sought to address cleaner and more efficient mineral processing technologies, strategies for business development, and international experiences.

In Elmina, Ghana, the second CASM AGM reinforced the knowledge base on formalization that emerged from Ica by providing a forum for stakeholders to discuss the 15 years of regularization efforts in the host country. The Elmina AGM further examined international experiences addressing main environmental and social challenges, including biodiversity, conflict diamonds and HIV/AIDS, and outlined the lessons learned through recent initiatives in ASM, such as the Yaoundé seminar. In addition, women from more than 12 African countries were assembled in Elmina. Thus, this CASM AGM was also highlighted by the formation of the African Women in Mining Network (AFWMN), marking a major step towards transforming the complex challenges facing women in ASM into opportunities.

The third CASM AGM in Colombo, Sri Lanka represented an important opportunity to determine how CASM could advance its role as a facilitator of development. An intense review of CASM's Global Partnership Programme and technical assistance programmes sponsored by CASM and others fostered understanding of what factors contribute to successes and failures, not only with respect to ASM activities, but community development on the whole. Key themes addressed conflict resolution, the establishment of downstream activities (as exemplified by the gemstone sector), gender mainstreaming and the elimination of child labour. Fair trade initiatives were also an important highlight. One of the unique components of that AGM was the focus on gemstones - including gem production, cutting and marketing - with experiences shared from Namibia, Madagascar, Thailand and Sri Lanka. The models presented from these countries indicate that considerable downstream opportunities exist for gemstones as well as other commodities. Increasing the capacity of the CASM network to enhance the secondary benefits from ASM represents an important step towards achieving CASM's primary mission.

Through the insight derived from CASM AGMs and Learning Events, coupled with input from members of the CASM network, a clear direction for CASM and its partners is emerging. As Peter van der Veen, Manager of the Mining Policy and Reform Division at the World Bank, stated at the 2002 AGM in Ghana, one of the critical questions remains to be "How to move (small-scale mining) forward to a more integrated, sustainable activity?" Current thinking contends that focus should be on communities, specifically looking at how "marginal ASM enclaves" can be transformed into resilient and healthy communities. Issues impeding this development process include opportunistic and self-serving types of government, social dysfunction, degraded environments and distorted mono-economies. Shifting to transparent, supportive governments, socio-cultural wellbeing, environmental integrity and economic diversity requires the implementation of specific mechanisms and tools at local, regional and national levels. The future of CASM is therefore oriented to how it can contribute to this shift.

These issues figured prominently on the agenda of a CASM-sponsored event in Washington, DC in June, 2005. The "Millennium Development Goals and

Small-Scale Mining: A Conference for Forging Partnerships for Action” sought to increase awareness of the significance of ASM in development and enlist support for the realization of the sector’s potential to advance a broad range of development objectives. This event established that ASM issues are closely aligned with the priorities of many donors, organizations and governments. Thus, in order to elicit the support needed to advance both ASM and human development, the profile of the sector must be raised significantly in the organizations, institutions and agencies that are currently absent from the ASM dialogue. Issues such as capacity building for fragile states, conflict, empowerment of women, environmental sustainability and HIV/AIDS are just a few areas where mutual objectives provide an entry point for collaboration. The MDG conference further recognized that, as an established and credible organization with a broad network of skilled and dedicated members, CASM would provide an ideal vehicle for the advocacy needed to promote ASM-related efforts and advance essential partnerships.

By expanding its role as a network builder, knowledge developer, knowledge sharer, and research supporter to also become an active facilitator in the development of sustainable communities, CASM will be well-positioned to effect positive change and meet the many challenges facing ASM. In order to advance this change, CASM has recently articulated a strategic approach that proactively responds to the needs of miners, communities and governments while contributing to higher level policy objectives. The CASM Strategic Plan speaks directly to the Millennium Development Goals and builds on insights and recommendations arising from recent major international and regional ASM initiatives². With advisory support from a Strategic Management Advisory Group (SMAG), which consists of members from DFID, UNECA, ILO and other organizations, and an External Advisory Group (EAG), which provides technical expertise and guidance to the CASM network, CASM is committed to achieving the objectives stated in the Strategic Plan and ultimately supporting poverty reduction by improving the environmental, social and economic performance of ASM in developing countries.

By sharing the wealth of knowledge and experience derived from CASM AGMs and Learning Events, it is hoped that those working in the ASM sector – both internal and external to the CASM network – will be better equipped to take the action needed to achieve meaningful results. This compendium summarizes the current state of knowledge on critical issues discussed at CASM events and captures the lessons derived from these meetings.

1.2 Artisanal and Small Scale Mining

Although a clear definition of artisanal and small-scale mining (ASM) has not achieved consensus, it commonly represents a spectrum of activities ranging in scale from small to large that is generally distinguished from “formal” mining by a relatively low degree of mechanization, high degree of labour intensity, poor occupational and environmental health standards, little capital

² Initiatives providing a foundation for the CASM strategy include all CASM Learning Events and Annual General Meetings, the Mining, Minerals and Sustainable Development Initiative (MMSD), the Extractive Industries Review (EIR), the Yaoundé Seminar on Small Scale Mining, Agenda 21 and the Millennium Development Goals (MDG).

investments and lack of long-term planning. With as much as 80% of activities taking place outside of a legal framework in some countries (ILO, 1999), ASM is typically an informal and highly disorganized activity.



Photo 1: Woman at a Ghanaian Galamsey Operation Hauling Water
(Photo: J. Davidson)

The nature of ASM in any given region often dictates the characteristics of the responses needed to mitigate its impacts. Baffour (2003) described four main types of ASM, each of which are driven by different factors and therefore result in somewhat distinct environmental, social and economic outcomes. *Seasonal ASM* provides a source of employment in agricultural off-seasons and often generates capital for both agricultural and non-agricultural activities. Frequently, seasonal ASM leads to migration of miners from traditional lands to mining areas. *Permanent ASM* is undertaken by miners who have settled in regions with established mineral resources, often where large-scale commercial or formal mining is present. In some cases, seasonal miners forego agriculture to undertake mining permanently. *Shock-push ASM* refers to mining catalyzed by major disruptions, such as droughts or conflict, which often necessitate relocation to regions where other economic opportunities are present. As ASM may be perceived to yield relatively high pay-offs with minimal investment, it is often chosen over other activities, despite the lack of expertise of most “new” miners. Finally, *Rush ASM* represents one of the most serious types of ASM in terms of environmental and social impacts. Most typical for high unit value commodities (e.g. gold, diamonds), news of a major strike can cause the influx of tens of thousands of miners to an area in a matter of months. With expectations of high incomes and low capital investment coupled with inadequate knowledge and skills, rush ASM often leads to dire socio-environmental and health conditions. This is exacerbated by poor infrastructure and services and a lack of government presence in often marginalized, remote and hastily established communities.

Rogers (2005) differentiated between three types of ASM. *Subsistence mining*, which is often seasonal, rush driven and/or highly migratory, is characterized by illegality and use of crude technologies. *Petty commodity mining* is marked by a greater degree of organization and permanence and generally has a higher potential for formalization. *Small-scale mining* is more mechanized and is operated like a business with a degree of planning and knowledge concerning mining practices. It further has a greater likelihood of being formal.

What constitutes a “miner” also is inconsistently defined. In some cases, only those undertaking the digging are considered miners, while many now include a variety of key groups in the designation, include diggers, processors, haulers and other labourers, pit owners, mine owners, title holders, equipment providers, explosives experts and other service providers.

The debate on the definition of ASM has continued for more than two decades without resolution. What has been largely accepted is that the classification of ASM must be context specific and should be determined at the regional or national level. For example, a small-scale mine in South Africa may be a medium- or large-scale mine in Ethiopia. It is evident, however, that although this debate will likely continue at local, national and international levels, energy should be directed towards tackling the major challenges facing the ASM sector.

1.2.1 The Problematique of ASM

Understanding the complex nature of ASM is critical to effectively implementing any measures to mitigate the negative and optimize the positive effects of these activities in the context of sustainable development. The problematique of ASM is a complex web of issues, its strands span policy and regulation, environment, human health, culture and society, and economics. At the centre of this web is poverty – it draws people into ASM and once its grip has solidly taken hold, it perpetuates participation in and the negative impacts of this sector (Fig. 1).

A sensitive interconnection exists between the environmental, social and economic elements of ASM and other economic activities. An increase in mining – whether it is catalysed by increased commodity prices, events such as droughts or conflict, or changing seasons – often leads to a decrease in the agricultural workforce, thereby affecting productivity of the that sector. As ASM activities lure people from their traditional livelihoods with the perception of greater incomes, a substantial influx of miners essentially thins the distribution of revenues from often marginal reserves, diluting the revenue earned by each miner (Baffour, 2003). Due to lack of capital, combined with limited knowledge of mining practices, mining methods are generally highly rudimentary and inefficient.

The links between poor mining practices, environmental degradation and human health are well known. In addition to chemical contamination of ecosystems, ASM can modify aquatic systems, for example, through silt accumulation in rivers or construction of water reservoirs (Akagi and Naganuma, 2000). Siltation of rivers caused by discharge of tailings into

waterways reduces light penetration and dissolved oxygen levels, thereby jeopardizing fisheries, and may result in flooding (Hinton, 2002). Flooding of abandoned pits or lands adjacent to waterways increases the net area of standing water, thereby contributing to malaria and other mosquito-transmitted diseases. In addition, deforestation for the purposes of site clearing, domestic use or mining processes (e.g. lime roasting kilns) can significantly impact families reliant on forests for fuel wood and, in some cases, food and medicine. Equally significant to human health, poor mining practices generate significant occupational hazards – landslides, shaft collapses, machinery accidents and dust and noise pollution are a few of the frequent concerns at many mine sites.

Being situated in remote regions and often established in an ad hoc manner, the resulting characteristics of many ASM communities are also important determinants of health and wellbeing. The influx of cash into a local economy, combined with a paucity of economic alternatives and a transient workforce often leads to an active sex trade and high rates of HIV/AIDS and other STDs. In addition, rampant drug and alcohol abuse, gambling, and violence are frequently reported. Further to this, misuse of ASM revenues to meet personal rather than family or community needs continues to be a barrier to positive change. Due to the location of these communities, the speed with which they are often established and the limited resources of governments in impoverished countries, these health and social issues are often compounded by a lack of services and infrastructure.

Poor health is a critical component of the ASM poverty cycle – when spouses or family members are infirmed and their capacity to work is diminished, a “healthy” family member must work harder to pay for normal living expenses in addition to health costs. Ill health of a family member may initially drive men, women and children into mining. Arduous work, combined with inexperience in mining and lack of knowledge about hazards, can exacerbate the potential for injury or illness; thus, the cycle of poor ASM practices, ill health and poverty is perpetuated.

An overarching element in this maze of issues is the regulatory regime in which ASM is housed. Although the impetus to regulate the ASM sector exists and is recognized by most legislators (Barreto, 1993), artisanal and small-scale miners are not properly considered within most legal frameworks. Fundamental factors that impede the development of suitable legislation include an inability to come to an agreement on how these activities should be defined and licensed (i.e. on the basis of operation size, mineral extracted, income generated, degree of mechanization, etc.), preference towards “formal” mine developers and inadequate government resources to strengthen miners’ capacity to understand and adhere to legislative measures (Veiga and Hinton, 2002). Lack of land tenure offers little incentive to satisfy legal requirements for environmental practices and further precludes access to credit, a critical necessity in terms of upgrading a mining operation (Baffour, 2003). It is evident that any legalization strategy must consider that (a) miners will undoubtedly opt to work outside of a regulatory framework if obvious benefits cannot be derived from operating within it and (b) many miners nevertheless do not have the resources or skills to effectively participate (Veiga and Hinton, 2002).

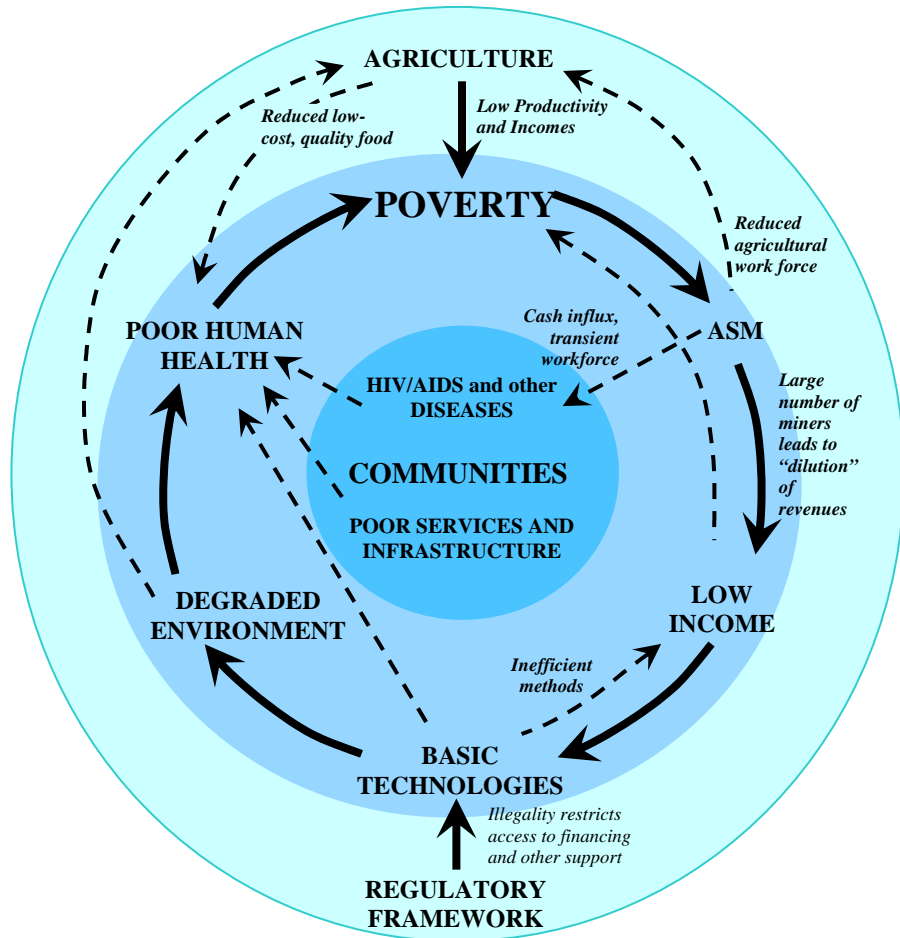


Figure 1: The ASM Poverty Cycle in an Agricultural Context

Thus, the problematique of ASM can be best captured by the following critical questions:

- If ASM is predominantly located in remote and often sparsely populated regions, how can ASM support viable markets for a diversified and resilient economy?
- If artisanal and small-scale miners lack both the land rights and other collateral needed to access financial and other support, how can they achieve more efficient and environmentally sound practices?
- Given the resource constraints of many governments and organizations, how can education, training and appropriate technology be provided to a largely informal sector in order maintain environmental integrity and protect human health and wellbeing?
- As the needs of ASM communities extend well beyond technical and legal realms, how can ASM be placed on the broader human development and poverty alleviation agenda?

- If organization, formalization and legalization are necessary precursors to access to information, technology, credit and support services, how can the barriers to their advancement be effectively overcome?
- How can the gap between sustenance and sustainability be bridged?

If poverty is both the catalyst and consequence of ASM, how can local, national and international efforts best support poverty reduction through ASM initiatives?

1.2.2 Employment

The scale of ASM activities throughout the world presents a daunting task for the international community. In 1999, the International Labour Organization (ILO) estimated that the number of artisanal and small-scale miners was 13 million in 55 countries. From this, it was extrapolated that 80 to 100 million people worldwide were directly and indirectly dependent on this activity for their livelihood (ILO, 1999).

With increasing prices of many commodities and population growth stimulating demand for industrial minerals combined with escalating poverty in many regions, the number of miners has recently been estimated at between 20 and 30 million (Veiga, 2003). Trends in employment growth and decline have been observed, with increases throughout Africa and Asia and decreases in Latin America. The intensity of ASM activities in different regions of the world is shown in Figure 2.

Since gold is easily sold, not influenced by the instability of local governments, and is high in value, it is believed by many to be the most important mineral extracted by artisanal and small scale miners. As the price of gold has been increasing since 2003, the number of artisanal and small-scale gold miners *alone* is now estimated at between 10 and 15 million people including 4.5 million women and 300,000 children (Veiga, 2003).

Despite this assertion, it is important to note that statistics on employment in ASM frequently overlook miners of industrial minerals, particularly those providing construction materials. In most developing countries, small operations mining aggregate, clay and dimension stone litter the roads and highways adjacent to urban areas in many developing countries. Limestone further serves cement production and road construction. Given high population growth rates in some countries (up to 4% annually), construction industry demands likely sustain the largest number of miners of any commodity. Regulatory frameworks that exclude construction materials from the legal definition of a “mineral”, as is the case in Ugandan constitution, exacerbate the lack of employment figures for the industrial minerals sector.

Clearly, establishing estimates for employment in the ASM sector is wrought with uncertainty. Lack of consensus concerning the definition of ASM, the seasonal and part-time nature of many employed by the sector, inadequate official statistics, and informality all complicate the collection of reliable figures (Hentschel et al., 2002).

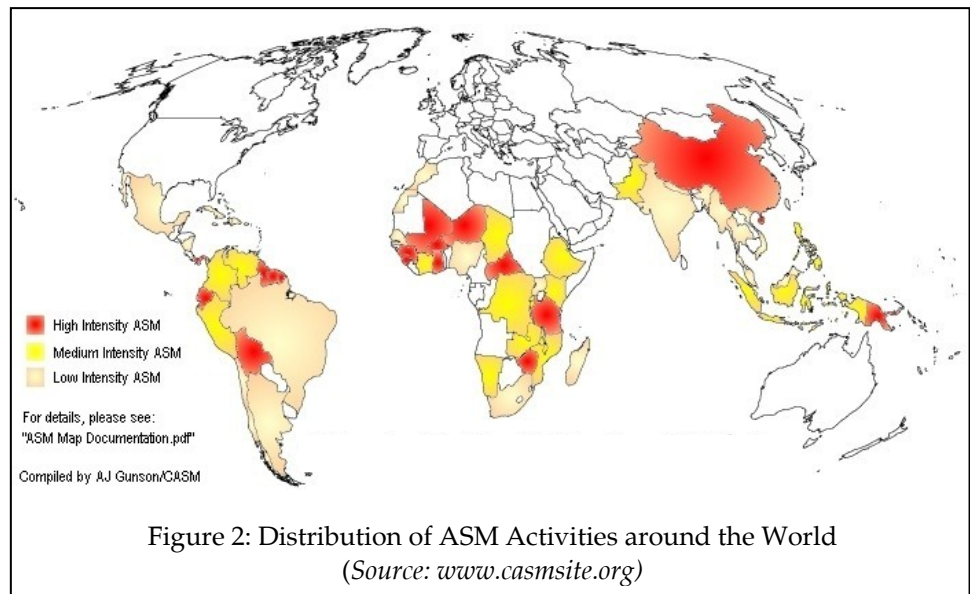
In an effort to provide insight into employment in key countries, the Mining,

Minerals and Sustainable Development Project (MMSD) presented ASM statistics compiled in a number of key countries. These estimates and those subsequently presented at CASM AGMs are presented in Table 1.

Table 1: Estimated Number of Miners in Selected Countries
(Source: Hentschel et al, 2002; CASM AGMs)

Country	Estimated Number of Miners	Percentage of Women Miners (%)
Bolivia	72,000	35
Brazil	10,000	-
Burkina Faso	100,000 - 200,000 (>100,000)	45
Central African Republic	> 100,000	-
China	3,000,000 – 15,000,000	-
Ecuador	92,000	-
Ghana	200,000 (180,000)	44
India	500,000	10
Indonesia	109,000	10
Malawi	40,000	50
Mali	200,000	30
Mongolia	(120,000)	-
Mozambique	60,000	-
Peru	30,000	-
Philippines	185,400 (300,000)	-
PNG	50,000 – 60,000	20
South Africa	10,000	5
Sri Lanka	(165,000)	-
Tanzania	550,000	25
Zambia	30,000	30
Zimbabwe	350,000 (500,000)	44*

- Notes: 1. CASM AGM estimate shown in brackets.
2. * Estimate includes both women and children



1.2.3 Commodity Types and Production

Artisanal and small-scale miners are actively extracting a wide range of precious and base metals, precious and semi-precious stones, and industrial minerals in mainly developing countries throughout the world. In the early 1990s, it was estimated that ASM produced 15-20% of the world's non-fuel minerals (Jennings, 1993). In 1995, it was estimated that ASM produced 20% of the gold, 40% of diamonds and almost all of the gemstones mined in Africa (Suttill, 1995). At the CASM AGM in Ica in 2001, it was suggested that ASM is responsible for global production of 12% of metallic minerals, 31% of industrial minerals, 20% of coal, 10% of diamonds and 75% of other gemstones (Beinhoff, 2002).

Although production is often quite small on a "per operation" basis³, due to the large number of people engaged in ASM, production by artisanal and small-scale miners well exceeds that of formal, large-scale miners in many countries. For instance, in the Philippines, Ghana and Ecuador, ASM gold mining generates more than two-thirds of national production and in Bolivia, ASM tin production is equivalent to that of the large-scale sector (Hentschel et al., 2004).

As high unit value commodities, like gold and precious gems (diamonds, rubies, emeralds etc), can be mined using relatively basic techniques and they are easily transported and sold through both legal and illegal channels, ASM represents a significant producer of these commodities in many countries. In Zimbabwe, more than 95% of the production of gold, chrome, tantalite and precious stones is attributed to ASM activities (Manyanhaire, 2004). Recently, annual production of gold and diamonds in Ghana was reportedly more than 250,000 ounces (>USD 75M) and 1,000,000 carats (USD 20M), respectively (Asante, 2003). The bulk of gemstone production in Sri Lanka, which totals 14 million carats (USD 60 million) annually and represents more than 90% of mineral exports, is attributed to artisanal and small-scale miners (Fowzi, 2004; Chandrajith, 2004). In the Central African Republic, where diamond mining is *exclusively* undertaken by artisanal and small-scale miners, 20 million carats contribute to about 4% of the GDP (Pelon, 2004). And in Brazil, *garimpeiros* (artisanal or small-scale miners) produced more than half of Brazilian gold in the early 1990s (Hanai, 1998).

As they require larger scale extraction and further refining to be viably extracted, many base metals, such as nickel, lead, copper, tin and zinc, are mined to a much lesser extent in the ASM sector (ILO, 1999). However, even the non-precious metals are mined on a small scale in many locales. For instance, ASM of base metals provides a greater source of employment than gold mining in Bolivia (Hentschel et al., 2004). In Uganda, 100% of iron, tin, wolfram and coltan production is undertaken on a small-scale – most of this material is sold as concentrate and exported for further refining.

Much like employment figures, ascertaining ASM production values of most mineral commodities is complex and confounded by the informal nature of most ASM activities. Illegal trading of, in particular, high unit value

³ Many large-scale mining operations can process several thousand tonnes of material daily while many ASM operations extract and process only a few tonnes per day.

commodities, such as gold and gemstones, and widespread local production and consumption of informally produced industrial minerals confound the establishment of accurate production figures. In Madagascar, where mining officially contributes 3% of the GDP, less than 10% of the actual production value is reportedly known (Razafimandimby, 2004).

It is clear that important precursors to the attainment of accurate production values include formalization of both the ASM sector and its markets as well as the entrenchment of mechanisms in monitoring institutions (e.g. Mines Departments, Customs and Revenue Agencies) for profiling and tracking ASM operations and their products.

2 ARTISANAL AND SMALL-SCALE MINING PRACTICES

As inefficient and environmentally destructive mining methods play such a pivotal role in the ASM poverty cycle (Section 1.2.1), CASM AGMs have sought to shed light on both the current practices of artisanal and small-scale miners and potential alternatives to these techniques. Although gold mining has received the bulk of attention on technical aspects of ASM, gemstones and, to a lesser extent, base metal ores such as coltan have also been addressed at CASM AGMs. Mining of low unit value commodities, such as salt and limestone, has received only marginal consideration.

Despite this, many of the mining and mineral processing methods highlighted at CASM AGMs are used for a range of commodities. These techniques vary considerably depending on the degree of mechanization. There are considerable differences between the highly rudimentary, manual methods that characterize artisanal mining (e.g. pick and shovel mining, hand panning and sluicing) and the sophisticated methods of “industrialized small-scale mining” (e.g. heavy equipment, controlled blasting, processing plants). The latter is mostly carried out by foreign companies and/or joint ventures and is normally out of reach of local people (Wotruba, 2003). To develop an improved ASM industry, there is a need for “intermediate technology”, which means better productivity with relative low investment costs (e.g. hydraulic monitoring/gravel pumping with improved sluice boxes). Information about these intermediate technologies is not available to most artisanal and small-scale miners and represents an area where major campaigns are critically needed (Wotruba, 2003).

Minerals may be mined either through extraction of primary ores (i.e. hard rock mining) or secondary ores (i.e. alluvial, colluvial or illuvial material). As the latter is easily concentrated by gravity processes, it is the source of most ASM production of heavy minerals like gold, cassiterite, tantalite and gemstones. Depletion of secondary deposits at the surface usually marks the end of mining activities at a given location as miners typically lack the skills, equipment and resources to effectively work the deeper deposits that sometimes underlie near-surface ores. Nevertheless, the absence of skills in drilling and blasting or ground support systems has not deterred many miners from delving into hard rock mining. In addition, many hard rock industrial mineral deposits (e.g. granite, marble) are also exploited by the ASM sector as complicated processing or refining is typically not required prior to sale.

2.1 Mining Methods

Both mining of primary and secondary ores can be either underground or surface operations and range from being highly manual to mechanized. Mining of primary deposits, an arduous undertaking given the effort required to break rock, involves the use of hammers, chisels, crowbars and wheelbarrows, or it may rely on the use of drills, explosives and, potentially, haul trucks and excavators. At one end of the spectrum, 20,000 hard rock gold miners in Mongolia employ hammers and chisels to laboriously extract ore at depths of up to 65m (Erdene Batar, 2004). At the other extreme and to a much lesser extent, several small miners throughout the world use drilling and

blasting to break rock prior to processing. Despite the increased rate of ore excavation, even in the latter case, mucking, hoisting and hauling of ore is typically manual.

Due to the lack of knowledge and a relatively high investment in terms of manpower, time and equipment, hard rock miners often practice high-grading, wherein rich veins are followed to depths and lower grade ore is disregarded. Although miners can generate significant returns in a relatively short period of time, by creating unstable pits and mine workings and discounting mine 'waste' with little consideration of its potential value, this practice is often regarded as an unsustainable use of a resource.

Primary ore extraction in the Kadoma-Chakari region of Zimbabwe typifies that found in other mine sites throughout the world. Rock breaking is manual, involving digging of shafts and tunnels to depths up to 30 metres using basic tools, such as picks, shovels, hammers and chisels (Hinton and Veiga, 2004). In many cases, steps are carved into shaft walls so ore can be hauled using shovels and buckets; however, hand operated winches are also used. Once at surface, ore is taken to the nearest milling centre. Although men predominantly undertake the digging in Kadoma-Chakari, women are also engaged in ore extraction, although usually at shallow depths (<5 m). Protective gear (gloves, coveralls, safety boots, helmets) and other safety precautions, such as ground supports, are generally absent (Hinton and Veiga, 2004).



Photo 1: Underground Coal Miner in Pakistan
(Photo by N. Jennings)

Mining of alluvial, colluvial or illuvial deposits similarly takes place using varying degrees of mechanization. Tools range from picks, shovels and wheelbarrows to hydraulic monitors (wherein loosely consolidated ore is fluidized using a high-pressure water hose and subjected to further processing) to heavy equipment, such as bulldozers, front end loaders and backhoes.

Mining of secondary deposits often also takes place directly within watercourses, where dredges ‘vacuum’ mineral-rich sands and gravels from river and lake bottoms using gravel or jet pumps. Typically, hoses range in diameter from 4-6 inches with a capacity of 150-280 m³ per day (Wotruba, 2003). Dredges may range from simple rafts floated with steel drums, relying on people equipped with crude diving gear to suck sediments through a pipe to sophisticated barges using mechanized cutter head systems to break through the ‘hard pan’ sediment crust to reach underlying gravels (Hinton et al., 2003). In either of these cases, mineral processing takes place on a floating dredge and tailings are discharged directly into the water body, creating significant environmental damage (e.g. siltation, chemical pollution).

Due to unstable ground conditions, underground mining in the case of secondary ores can be particularly perilous. This is the case for gemstone mining in Sri Lanka, where miners excavate shafts down until gem-bearing sands and gravels are encountered. As the reef is slowly mined out, a network of tunnels is developed and often linked to other shafts. At Pelmadulla in Sri Lanka, the underground workings reach depths of 15-20 m, with tunnels extending another 20m or more into the gem-bearing sands and gravels (CASM, 2005). Alluvial deposits in Sri Lanka typically occur as single or multiple gem-bearing gravel layers, with the latter presenting additional challenges in their extraction. Working in revenue-sharing groups of 8-10 people, miners at Pelmadulla use basic tools to dig and haul the ore to surface. Support systems are typically rudimentary, comprising timber to retain the marginally competent host rock and local vegetation to reduce the influx of water into the workings.

Open pit mining is the most prevalent form of mining of both primary and secondary ore deposits. Ranging in size from tens of metres in diameter and depth to just a few metres deep (“wildcat” pits), surface mining can be undertaken using the most basic techniques (e.g. shovels and sledgehammers) or heavy machinery (e.g. bulldozers, excavators). Due to the sheer volume of material extracted, much of it waste rock, open-pit mining can be particularly destructive and, when rock faces are steeply dipping and benches are absent, the risk of land failure is often high. Shaft collapses and ground failure are among the most frequent causes of death in ASM. On March 31, 2003, a 100m wall of gravel and rock collapsed in Chima, Bolivia, killing more than 100 people.

Despite its significance in terms of mine productivity, environmental impact and occupational health hazards, ore extraction methods receive far less attention than that afforded to mineral processing.

2.2 Mineral Processing

Since its inception, best practices in mineral processing methods have been a recurring theme at CASM Learning Events. Driven largely by more than two decades of international attention focused on mercury misuse in gold mining, efforts related to the mineral processing aspect of gold mining has, in particular, yielded a wealth of information that seeks to not only reduce

environmental impacts, but improve mineral recovery, thereby increasing economic benefits and receptiveness for cleaner methods. As Hermann Wotruba stated at the 2003 CASM AGM in Elmina, “These technologies exist... Massive campaigns to spread out the knowledge and introduce the cleaner technologies are needed now.”

The suitability of alternative mineral processing methods depends on the commodity, the nature of the ore, the characteristics of the ASM operation (e.g. organization of work) and skills and resources of the miner. Main components of mineral processing (beneficiation) include comminution (crushing and grinding), concentration through physical or chemical means, and dewatering. Further refining through metallurgical processes such as roasting and smelting, is often beyond the reach of most artisanal and small-scale miners.

Comminution involves crushing and grinding of ore to reduce particles to a size suitable to liberate valuable minerals from gangue minerals (i.e. waste) through further processing. Like all ASM methods, comminution processes can be highly manual, using hammers or simple mortars and pestles, or somewhat “higher tech”, using mechanically-driven mills. Crushing and grinding are required of most primary ores and is undertaken for metallics, gemstones, and industrial minerals (e.g. in the production of aggregate or preparation of limestone).



Photo 2: Tanzanian Women Pounding Gold-bearing Ore
(Photo by M. Veiga)

Many artisans rely on simple sledgehammers or various types of mortars and pestles to reduce particle sizes of rock. Mortars and pestles can comprise heavy iron scrap recovered from other industrial activities (e.g. car parts), laterite (pestles), or hard rock. The ‘quimbalete crusher’, which consists of a large

boulder that is rocked back and forth within a stone pestle, has been used for millennia in Peru to grind gold bearing ores during amalgamation with mercury (Hruschka, 2002). In some cases, large boulders are initially broken by heating to a high temperature with fire and subsequently dousing with water to induce fragmentation, a practice which depletes local fuel wood resources. Due to the low skill and capital required, these 'low tech' methods are the norm in many countries. For instance in Uganda, more than 90% of crushing and grinding of primary metallic and industrial mineral ores (e.g. limestone, aggregate) is undertaken using these basic techniques.

More mechanical means, such as hammer, ball, stamp and muller mills, are employed by miners when they possess the skills and resources to do so. These operations process more tonnes per day and have lower manpower requirements than a manual operation, but are constrained by the availability of resources including power generators, fuel and replacement parts (e.g. steel balls and drums) (Hinton et al., 2003). It should be noted that the use of mechanized equipment may not equate to the appropriate use of technology. Problems such as over- or under-grinding, use of inappropriate feed size, and the potential for damage to the valuable mineral (e.g. gemstones) affect the suitability of certain comminution techniques for a given ore.



Photo 3: Chinese Muller Mill
(Photo by AJ Gunson)

The key characteristics of a range of mechanized comminution methods were discussed in detail during a CASM workshop on “Technologies for Small Scale Mining”, presented by Hermann Wotruba of the University of Aachen in Germany. A summary of key advantages and disadvantages of these methods is presented in Table 2.

As it increases liberation of valuable minerals, effective comminution practices are critical to improved recoveries and, therefore, economic benefits from mining. In order to achieve these benefits, it is clear that many miners need considerable support, not only in terms of resources to access and operate this equipment, but also with respect to its appropriate use. Even when miners use mechanized comminution methods, liberation is often insufficient and ore must be recirculated through the mill. In addition to a host of technical assistance projects being undertaken throughout the world (described in Chapter 9), some companies are working specifically with small miners to provide technical support and equipment for appropriate and effective comminution techniques. At the 2003 CASM AGM in Ghana, Kevin Woods of Small Scale Mining Supplies Pvt. described efforts to introduce the ‘Katanka Stamp Mill’ in Zimbabwe. The mill can be readily shipped and erected, uses easily replaceable, standard parts, and requires low energy to process 0.75 tonnes of coarse rock per hour (Woods, 2003).

Once primary ores have been subjected to comminution or secondary ores have been ‘prepared’ through hydraulic monitoring, dredging or simple digging, they are subjected to concentration techniques to aid the recovery of the valuable mineral. Of all concentration methods, gravity separation is the easiest to undertake and thus the most commonly employed. Used for heavy minerals (e.g. gold, cassiterite, tantalite) and gemstones, artisanal and small-scale miners rely on a range of equipment, such as pans, sluices and strakes, and, to a lesser extent, modern equipment like jigs, shaking tables, spirals and centrifugal concentrators, to isolate the desired mineral from waste material (Photo 4). Descriptions of the main gravity separation methods are shown in Table 3.

Many small miners do not have the expertise or resources for further processing of many minerals, such as cassiterite (tin dioxide), wolframite (tungsten oxide) and coltan (columbite-tantalite, or niobium oxide and tantalum oxide). In these cases, minerals are typically sold as concentrates and elsewhere subjected to further refining. In the case of gold ores, chemical processes such as mercury amalgamation and, to a much lesser extent, cyanide leaching, are, however, prevalent in many ASM operations.

As it is simple, cheap, quick and effective, most gold miners employ mercury amalgamation to recover gold from concentrates or “whole ores”. When whole ore amalgamation is undertaken, mercury is added during crushing and grinding (i.e. prior to gravity concentration), on the surfaces of carpeted or riffled sluices or it is spread by hand across copper plates. In the latter situation, gold amalgamates with mercury that is bound to the copper and is later scraped off the surface. Due to scouring (attrition) by coarser particles in the slurry, this method often results in substantial mercury losses to the environment (Wotruba, 2003). In general, it has been found that when the whole gold ore is amalgamated the ratio of mercury lost to gold produced is

well in excess of 3:1 (and has been reported as high as 40:1), whereas amalgamation of concentrates yields a ratio of only about 1:1 (Veiga, 1997).

Table 2: Mechanized Methods for Crushing and Grinding at ASM Operations
(From Wotruba, 2003)

Description	Advantages	Disadvantages
Jaw Crusher • Capacity: 0-1000 t/h	<ul style="list-style-type: none"> • Can be locally produced • Simple operation and maintenance • Improves capacity for other mills 	
Stamp Mill • Capacity: 50-90 kg/h per stamp	<ul style="list-style-type: none"> • Can be locally produced (can be made of wood or steel) • Can be driven by a water wheel • Feed size up to 100mm (depending on weight of stamps) • Can work with hard feed • Suitable for batch processing 	<ul style="list-style-type: none"> • Low capacity (especially for fine grinding) • Noise and vibrations • Often used simultaneously with mercury amalgamation (gold ores)
Chilean (Muller) Mill • Capacity: 3-25 t/d	<ul style="list-style-type: none"> • Can be locally produced • Can be driven by a water wheel • Feed size up to 10mm (depending on diameter and weight of wheels) • Works with hard material • Suitable for batch processing 	<ul style="list-style-type: none"> • Relatively high investment costs (especially for larger mills) • Often used simultaneously with mercury amalgamation (gold ores)
Ball Mill • Capacity: 0-500 t/h	<ul style="list-style-type: none"> • Can be locally produced • Product size can be very fine (e.g. for flotation) • Works with very hard material • Saves coarse gold inside 	<ul style="list-style-type: none"> • Needs pre-crushing (feed size must be < 20mm) • Danger of overmilling • Gold mining: mills gold to very fine flakes, stains gold with iron • Not good for batch processing • Balls difficult to find in “non-mining” countries • High investment costs compared to capacity
Hammer Mill • Capacity: 0.3-2.5 t/h (with water)	<ul style="list-style-type: none"> • Can be locally produced • Feed size up to 60 mm • Suitable for batch processing • Light weight • Simpler operation and maintenance • Low cost compared to capacity 	<ul style="list-style-type: none"> • Not for very fine product size • Not for very hard material • Not good for brittle valuable minerals (e.g. cassiterite, tantalite) • Relatively high operation costs (hammer replacement)

Notes: 1. Capacities depend on the product size, feed hardness, and characteristics of the mill components.
 2. t/h = tonnes per hour; t/d = tonnes per day; kg/h = kilograms per hour

Skilled miners only amalgamate gravity concentrates, a practice that contributes to significant reductions in mercury emissions and enables recovery of more than 90% of gold from concentrates (Hinton et al., 2003). Amalgamation of concentrates generally takes place in pans or basins, or less frequently in amalgamation drums, after which the ‘wet’ amalgam is squeezed through a cloth (Wotruba, 2003).

Table 3: Gravity Concentration Methods

Description	Advantages	Disadvantages
<p>Pans</p> <ul style="list-style-type: none"> • Smooth or grooved bowls or basins used to isolate heavier minerals by washing away fines. 	<ul style="list-style-type: none"> • Low cost • Easy to operate • Readily accessible 	<ul style="list-style-type: none"> • Low capacity • Cannot recover fine gold • Discontinuous process
<p>Sluice Boxes (alluvial), Strakes or Blanket Tables (primary)</p> <ul style="list-style-type: none"> • Heavy minerals settle out behind riffles, strakes or in carpet fibres 	<ul style="list-style-type: none"> • Can be locally produced • Low cost • No motor or moving parts • Easy to operate • Good recovery (even of fine gold) with proper operation • High capacity (alluvial mining) 	<ul style="list-style-type: none"> • Manual • Security problems • Discontinuous process
<p>Jig</p> <ul style="list-style-type: none"> • Induce density and size stratification of particles through a pulsating (up and down) motion. 	<ul style="list-style-type: none"> • Can be locally produced • High capacity (alluvial mining) • Relatively low cost • Good recovery of heavy minerals • Wide size range of feed and products • Recovers gold flattened by ball mills 	<ul style="list-style-type: none"> • Relatively difficult to set-up and operate • Needs motor • Needs hutch water
<p>Shaking Table</p> <ul style="list-style-type: none"> • Generates motion on an angled surface covered in parallel riffles, which induces separation of particles based on their densities and particle sizes 	<ul style="list-style-type: none"> • Recovery of various products (concentrate, middlings, tailings) • Visible process, good control • Good recovery • Relatively easy to operate • High enrichment factor • Can be used to clean amalgamation tailings • Continuous process • Can be locally produced 	<ul style="list-style-type: none"> • High cost relative to its limited capacity (Best used as cleaner step) • Limited capacity (~1.5 t/h) • Needs very steady feed and constant supervision • Recirculation of middlings required • Needs motor
<p>Spirals</p> <ul style="list-style-type: none"> • Separation occurs as centripetal forces pull denser minerals to the outer stream of the spiral. 	<ul style="list-style-type: none"> • Recovery of various products (concentrate, middlings, tailings) • Material visible during process • Good recovery (gold and sulfides) • Easy operation • Continuous process • High capacity for small primary gold mining (50 t/d for a single start spiral) • No motor or moving parts 	<ul style="list-style-type: none"> • Needs material screened to minus 2mm • Low enrichment factor (best used in pre-concentration) • Needs ~4m height from feed to discharge • Not suitable for local production
<p>Centrifugal Concentrators (Batch type)</p> <ul style="list-style-type: none"> • Uses a fluidized bed spinning-bowl that generates a centrifugal force that can reach up to 200G 	<ul style="list-style-type: none"> • Range of sizes and capacities (up to 100 t/h) • Good recovery, even very fine gold • Very high enrichment factor (does not require secondary upgrading) • Good for cleaning amalgamation tailings • Highly secure process 	<ul style="list-style-type: none"> • High investment costs • Needs clean and high-pressure water • Limited sulphide recovery • Difficult handling • Needs electric motor • Needs narrow classified feed • Spare-parts and maintenance difficult • Not suitable for local production

The resulting 'dry' amalgam is then burnt in a pan or shovel using a blowtorch, open fire or other heating element in order to volatilize the mercury. The remaining sponge-like gold *doré* is further refined, often in off-site gold shops, through smelting to remove residual mercury and other impurities.



Photo 4: Gravity Separation by (a) Wind Sorting, (b) Panning and (c) Simple Log Sluice
(Photos by (a) H. Wotruba; (b) M. Veiga and (c) R. Gaucher)

Cyanide, if properly handled, can be an effective alternative to mercury amalgamation. As cyanide solution percolates through gold ores in vats or heaps, it leaches gold and other metals (e.g. silver, iron, mercury), and is subsequently recovered at the base of heaps or tanks. The gold-laden cyanide solution is then passed through carbon filters (often charcoal or coconut shells), which adsorb the gold to the surface. Recovery of gold from carbon by elution (gold stripping) and electro winning is often too complex for many miners and is generally done off site. Alternately, the solution is passed through fine zinc strips, wherein gold replaces zinc via the Merrill-Crowe process (Gunson, 2004). The strips are subsequently smelted to recover gold.

Unfortunately, many ASM operations currently employing cyanidation use it to recover gold from amalgamation tailings and not for primary processing of the ore. This practice can result in dire environmental consequences. As cyanide effectively dissolves metallic mercury and other heavy metals, it can significantly increase their mobility, and potentially their bioavailability⁴, in the environment. Moreover, mercury interferes with gold recovery by cyanidation. Consequently, “it makes absolutely no sense to combine amalgamation and cyanidation” (Wotruba, 2003).

Although it can be highly effective for fine and sulphide-associated gold, flotation is rarely employed by artisanal and small-scale miners (Wotruba, 2003). Flotation involves the addition of chemicals to separate valuable minerals from waste by floating one component (usually the desired minerals) and sinking the other (usually the tailings). The need for expensive, toxic and often difficult to obtain reagents, fine grinding and considerable technical skill has severely limited the use of flotation in ASM. Other leaching reagents, such as chlorine, bromine, and thiourea, as well as gold-oil agglomeration and direct smelting of high-grade concentrates, also show promise for gold processing (Wotruba, 2003). However, as in the case for cyanide and flotation, the technical complexity, high costs and lengthy processing times preclude widespread use of these alternatives in the ASM sector.

2.3 Waste Management

Because it requires a certain level of geotechnical and geochemical expertise, waste management is one of the most overlooked, yet environmentally deleterious aspects of ASM. Like mining or mineral processing techniques, responsible waste management practices *can* be justified to artisanal and small-scale miners.

Although repetitive scavenging of waste dumps, usually by women and children, takes place in many areas throughout the world, many miners are unaware that in some cases up to 80% of valuable minerals are frequently lost with tailings due to inefficient mineral processing methods. In many locations, process water is scarce, yet recycling is infrequently practised. Furthermore, discharge of mine waste into waterways or onto agricultural lands is a frequent source of conflict with other land users and, in many cases, renders impacted

⁴ *Bioavailability*, or biological availability, refers to the potential for a substance to be incorporated into biota, including plants, fish and humans.

areas virtually unusable for other purposes. Despite these issues, structured tailings impoundments, well-situated waste rock piles and settling ponds are absent at most ASM sites around the world. Solid or liquid wastes generated by artisanal and small-scale miners are too frequently discharged to the nearby environment with little consideration of the environmental, economic and social consequences.

Tailings and Process Water

Separation of solids from tailings streams best takes place in sedimentation ponds, vats (in series) or tailings dams (Wotruba, 2003; Hinton et al., 2003). Simple settling ponds or tanks are relatively low-cost, easy to construct and are conducive to the segregation of tailings or potentially toxic chemicals (e.g. cyanide). If water is further cleaned, for instance using a thickener with flocculants, it can be reused as process water or safely discharged into waterways (Wotruba, 2003). Spiral classifiers or hydrocyclones can also be used to separate sand from water, enabling dry deposition of tailings

In terms of tailings disposal, miners will ideally select a site that is topographically amenable to containment. Dams should be constructed adjacent to hillslopes or in natural depressions downgradient from processing sites in order to inhibit tailings dispersion and mobilization into waterways. Locally available materials, such as fine sands and clays, can be used to create low permeability barriers that impede migration of leachate stored in the impoundment. Some understanding of the water balance (i.e. the water storage capacity and amount of water coming into and exiting the impoundment) is critical to preventing either chemical or physical failure of the dam. Due to the potential magnitude of impacts from dam failure, artisanal and small-scale miners should have technical support from qualified experts throughout dam design and construction. The costs of this are prohibitive for many miners – it is clear that support from the international community, governments, academics, NGOs and others is needed to address this issue.

In areas where a number of operations are active, “community tailings dams”, which can serve thousands of miners simultaneously, may be a viable option. In Potosi, Bolivia, 8,000 miners produce about 1,500 tonnes of ore daily which is processed at 40 separate flotation plants. Approximately 1,200 tonnes of waste are directly discharged into La Rivera River daily from these operations. Construction of a collective tailings impoundment was supported by the German Financial Corporation (KfW) at a cost of about US\$ 5 million (Hentschel et al., 2001). Although a costly undertaking that certainly is not viable in all locations, this endeavour signifies an important model for addressing tailings disposal at ASM sites.

Waste Rock

Waste rock generated during mining is, much like tailings, often discarded wherever is convenient, in some cases obscuring underlying mineral resources. Due to the comparatively high volumes produced in industrial mineral activities, waste management practices can be particularly damaging. At many mines, waste rock still contains valuable minerals and is later processed once high grading has depleted the ore that gives quick returns on investment. Elsewhere, waste rock is crushed and sold as aggregate for building construction. Unfortunately, in many cases, the value of waste rock is

unknown to miners or is too low to justify processing. The chemical and physical stability of waste rock piles also presents cause for concern for inhabitants around mining sites. For example, at Guéguéré in Burkina Faso, a waste heap piled adjacent to a trench collapsed in November 2002, resulting in the deaths of 35 miners (Jacques et al., 2002).

Reclamation

Although it is frequently a requirement of many legal frameworks, most artisanal and small-scale miners do not formally practise reclamation of mine sites. ASM generally takes place concurrent with agricultural activities; thus, reuse of mine sites for farming or grazing takes place where possible, particularly when land is in short supply. Unfortunately, soil and water quality are often degraded for many years after activities have ceased, bringing little benefit to the community. Practices such as backfilling pits and underground workings or stockpiling topsoil for future placement on waste dumps are simple measures that can significantly help mitigate these impacts.

Examples of reclamation in ASM do exist. In the case of Venezuela, the U.S. Forest Service Department in cooperation with the local Association of Miners administered training for the revegetation of ASM sites. Miners applied a revegetation technique for the reclamation of steep hills through the use of mulches and straw “carpet” with biodegradable plastic (Hinton et al., 2003). At the Kias Mine in the Philippines, the Kias Explorers Association dues fund a local tree planting programme (Hinton et al., 2003).

Ultimately, waste management solutions - in conjunction with clear advantages - must be communicated to miners. Benefits may include anything from easier access to tailings, which can subsequently be reprocessed at a later time, to an ample supply of process water to better community relations. Particular attention must be paid to the industrial minerals sector, whose quarries can generate significant volumes of waste, usually with little interaction or support from government authorities. Formalization and legalization, coupled with the incentives and extension services needed to achieve this, are critical to effective waste management in the sector.

3 ASM AND THE NATURAL ENVIRONMENT

It is indisputable that the natural environment is essential to people's ability to generate income and satisfy household needs, particularly in informal economies. In addition to food production, the environment is critical to food security and is relied upon for water, biomass fuels, as well as medicinal plants and resins. It has further been suggested that interaction itself with the natural environment provides a host of therapeutic health benefits (Frumkin, 2001).

Despite its contribution to rural economies, the effects of ASM on the natural environment present a cause for concern for affected communities and natural resource-reliant livelihoods. Deforestation of mine sites and the discharge of mine tailings into natural waters can cause river siltation, which damages fisheries and can significantly degrade ecosystems. Diversion of rivers and creeks for use in mineral processing can significantly modify hydrology, creating large tracts of flooded land and altering water levels even in communities far downstream from mining. Flooding, as well as standing water in abandoned pits, creates ideal breeding ground for malaria-carrying mosquitoes. One of the most persistent environmental impacts from ASM relates to the emission of harmful chemicals, which have the potential to reach aquatic systems, affect plants and animals and detrimentally impact human health. In addition, miners often have little awareness of the significance of biologically sensitive areas or other economic activities, putting these vital natural assets at risk.

In ASM regions where a large number of miners are active, the consequences can be particularly severe. In addition to the collective effects from poor mining and reclamation practices, poorly serviced, ad hoc communities constructed to serve the mining workforce generate large volumes of domestic waste with serious repercussions for the surrounding ecosystem and its residents.

CASM AGMs have sought to strengthen knowledge on both the assessment of environmental impacts and measures to prevent and mitigate these effects. A primary basis for the many initiatives centered on the improvement of mining methods relate to the linkages between technology and the natural environment. However, lessons from CASM events and numerous other initiatives have demonstrated that tackling the environmental consequences of ASM requires consideration not only of technical issues, but social, economic, legal and cultural factors as well. A critical element of these integrated efforts involves understanding the interconnection between ASM activities and ecosystems and, in particular, its main constituents: surface and groundwater, land resources and biota⁵.

3.1 Water Resources

Surface water and groundwater are both main receptors of mining waste and effluent and primary conduits of these pollutants to other lands. In addition,

⁵ *Biota* refers to all of the living organisms in a given ecosystem, including microorganisms, plants and animals.

modification of hydrology through diversion or damming of rivers can detrimentally affect the quantity and quality of waters both onsite and downstream from mining. As such, surface and groundwater provide a means to extend the impacts of mining from local to regional and even international levels. The main effects of ASM on surface water and groundwater include the following:

- Siltation due to tailings discharge to water bodies, deforestation and riverbank destruction;
- Modifications to local and downstream hydrology;
- Mercury and cyanide pollution (in gold mining)
- Acid rock drainage and heavy metals pollution;
- Oil and gas pollution (from mining equipment); and
- Domestic waste pollution.

The environmental degradation associated with the excavation of large volumes of material can significantly effect groundwater (when the water table is encountered), as well as surface water in adjacent drainages. Waste material, often heaped close to pits, creates a source of silt which can be eroded by rainfall, clogging nearby rivers. In Gugub Village, Sudan, Ibrahim (2003) estimated that 400,000 to 500,000 tonnes of waste and tailings are piled adjacent to pits. Siltation resulting from the erosion of mine waste and deforestation, coupled with the direct discharge of tailings into waterways, is one of the most significant impacts of ASM on the environment (Hentschel et al., 2002). On the Tapajós River in Brazil, for example, siltation from garimpos employing dredges and hydraulic monitors can be observed as far as 300-500 km downstream from mining areas (Carmouze et al., 2001).

Siltation of rivers reduces light penetration and dissolved oxygen levels thereby making rivers uninhabitable for fish. As well, silt build-up may effectively modify the dimensions of drainages such that flooding occurs. With decreased organic matter due to deforestation, the water retention capacity of soils also diminishes, further increasing the potential for flooding. Fishery depletion and frequent flooding can obviously have detrimental effects on riverine communities and others dependent upon fish as a food source. As flooding tends to increase the net area of standing water, it can also contribute to increases in malaria and other mosquito-transmitted diseases.

At the 2001 CASM AGM, Jose Vidalón described the degradation from gold mining in the Madre de Dios region of Peru. More than 1,000 ASM operations of varying scales take place along 350 km of tributaries to the Madre de Dios River. Water recycling is not practiced and all process water and tailings from alluvial gold mining activities is discharged directly to these surface waters. Miners mainly employ dredges, hydraulic monitors and sluices, although along the Huepetuhe River, a large, mechanized operation that utilizes excavators, front-end loaders, trucks and sluices to process 70 million cubic metres of gold ore annually. Producing 10 tonnes of gold per annum, the Huepetuhe River operation discharges all tailings to the river with devastating effects on the aquatic system. Extensive siltation of the river, as evidenced by turbidity levels up to 50,000 ppm, has resulted in the near extinction of aquatic life and obstruction of waterways. These effects, combined with widespread

mercury pollution, are the main surface water impacts in an area adjacent to three nature reserves (Vidalon, 2002). In Sur-Medio and Puño in Peru, where mercury is added directly to quimbaletes during crushing, mercury concentrations in tailings have been measured as high as 1.5 kg_{mercury}/tonne_{tailings} and average 0.5 kg_{mercury}/tonne_{tailings} (Hruschka, 2002).

In Mongolia, where more than 120,000 artisanal hard rock and placer miners are active, mercury poses a serious risk to environmental and human health. Primarily used by about 20,000 hard rock miners, mercury-laden waste is accumulating throughout villages where processing takes place (Appel, 2004). This situation is exacerbated by widespread mercury pollution in the Boroo River, where a storage tank exploded in 1956, leaking 5 to 10 tonnes of metallic mercury (Appel, 2004).

Mongolian mercury miners are now actively panning the river sediments and selling the recovered mercury to the gold miners in the region. The men, women and children engaged in both mining of gold and mercury, as well as those consuming local fish, are consequently at considerable risk to the harmful effects of mercury. In response to this, a comprehensive programme has been proposed comprised of training and sensitization of artisanal and small-scale miners, doctors and village officials in health issues and mercury alternatives (Appel, 2004). A mercury reclamation pilot study will also be conducted involving the processing of 800 cubic metres of Boroo River sediments using amalgamation plates.



Photo 5: Pouring off Excess Mercury in China
(Photo by AJ Gunson)

Peru and Mongolia are certainly not exceptional cases. Due to its widespread misuse in gold mining and the severe implications for environmental and human health, the discharge of mercury by gold miners is one of the most studied environmental impacts of ASM. The greatest concern with respect to the environmental effects of mercury relates to its potential for transformation into methylmercury. A highly toxic form of organic mercury that is easily absorbed by biota, methylmercury tends to increase in concentration up trophic levels of the food chain, particularly in aquatic systems. For example, mercury concentrations can be more than a million times greater in predatory fish compared to the water they inhabit (US EPA, 1999). Consequently, inhabitants of communities dependent upon mercury-laden fish as a primary food source are likely to have elevated levels of mercury in hair, blood and urine (Wheatley et al., 1995, Malm et al., 1997). Although metallic mercury, the form used in ASM, may be relatively stable in soils, once it reaches an aquatic system, it can be subjected to chemical and biological factors (e.g. pH, organic matter, and oxygen content) that facilitate its transformation into methylmercury.

It is estimated that between 800 and 1000 tonnes of mercury are annually released into the water, land and air from ASM activities around the world (Veiga and Baker, 2004). The erosion or direct discharge of mercury-laden mine tailings into water bodies is the main source of mercury to natural waters. However, atmospheric deposition of mercury vapour on surface water is also significant. Most of the mercury in natural waters is associated with particulate (e.g. clay, silt), thus it tends to be retained in sediments or transported downstream with fine suspended particles. Consequently, ingestion of water in mercury-polluted areas tends not to pose a risk to human health – consumption, particularly of contaminated fish, is the main concern.

The Global Mercury Project (GMP) is an innovative initiative seeking to reduce mercury emissions from artisanal gold mining. With major projects in mining areas of six participating countries – Zimbabwe, Tanzania, Sudan, Brazil, Indonesia and Lao PDR – the GMP is in the process of introducing cleaner technologies, training miners, developing regulatory mechanisms, strengthening governance, and building the capacity of local laboratories and health authorities to monitor mercury pollution. GMP project sites were selected based on the importance of artisanal and small-scale gold mining in these regions and the proximity of communities to international waters that may be impacted by mercury from ASM (Veiga, 2003). The GMP is jointly supported by the Global Environment Facility (GEF), United Nations Development Programme (UNDP) and is carried out by United Nations Industrial Development Organization (UNIDO).

At the 2003 CASM AGM in Ghana, Marcello Veiga, Consultant to UNIDO and Chief Technical Advisor of the GMP, detailed the challenges faced by the project in target communities. More than 50,000 people reside in the mining areas targeted by the GMP and so may be susceptible to exposures to mercury through aquatic pathways. Substantial differences in mercury releases are observed between project sites based on factors including the number of miners, mining methods and the local price of mercury (Veiga and Bernaudat, 2003).

Typically, the ratio of mercury lost to gold produced is used to establish emissions. The highest reported ratio in GMP-target communities was observed in Talawaan, Indonesia where 1 kg of mercury is added to each ball mill for every 30-40 kg of ore processed (Table 4). This results in a mercury_{lost}:gold_{produced} ratio of between 60:1 and 90:1 translating to annual emissions on the order of 20 to 30 tonnes from this mining area alone. Conversely, in the GMP-target community of Luang Prabang in Lao PDR, gold-bearing heavy mineral constituents are separated from ore by sluicing or panning prior to amalgamation, resulting in annual emissions of only 1 – 2 kg (Hinton and Veiga, 2004)

Table 4: Mercury Use in GMP Communities
(after Hinton and Veiga, 2004)

GMP Site	Mercury Price ¹ (US\$/kg)	Hg _{lost} :Au _{produced}	Hg lost (tonnes/a)
Brazil - São Chico	15 – 30	1.5 – 33	0.03 – 0.04
- Crepurizinho	15 – 30	1 – 1.5	0.3 – 0.5
Indonesia - Galangan	9 – 12	1 – 2.5	0.3 – 0.5
- Talawaan	10 – 15	60 – 90	20 – 30
Lao PDR - Luang Prabang	75 – 88	0.3 – 0.5	0.001 – 0.002
Sudan - Blue Nile	25 – 30	1 – 1.5	0.3 – 0.4
Tanzania - Rwamagasa ²	18 – 25	1 – 1.5	0.03 – 0.06
Zimbabwe - Kadoma ³	12 – 25 ^(*)	1 – 3	3 – 5

1. International Price of Mercury ~US\$4/kg.
2. Based on mercury use at the Blue Reef Mine only.
3. Based on consumption at mills and by panners

The majority of the mercury discharged by these miners enters aquatic systems, which may ultimately affect international waters such as the Nile River, Amazon River and Mekong Delta. Veiga indicated that much of this mercury originates in OECD countries, which are often oblivious to its end use. In 2000, the US and Europe sold 280 and 480 tonnes of recycled mercury on the international market, much of it ending up in the hands of gold miners (Veiga and Bernaudat, 2003).

Where amalgamation tailings are subjected to cyanidation, highly mobile, soluble mercury-cyanide compounds form, resulting in the transport of both mercury and cyanide considerable distances in aquatic systems. In addition to the environmental effects of each of these substances, it has been suggested that cyanide may contribute to the methylation of mercury, exacerbating related risks (Veiga and Bernaudat, 2003). At the GMP-site in Zimbabwe, many of the 70 milling centres are employing cyanidation after amalgamation, creating a hazardous situation for area residents as well as those living downstream on the Zambezi River (Veiga and Bernaudat, 2003). Cyanidation of amalgamation tailings is conducted in countries throughout the world, including Brazil, Ecuador, Indonesia and China.

Even when not undertaken in conjunction with amalgamation, cyanide alone can pose a risk to natural waters. Many miners using cyanide discharge effluent into nearby rivers following gold stripping. As it effectively dissolves other metals in ore, cyanide effluent often also contain high concentrations of

lead, cadmium, zinc and copper. These metal-cyanide compounds are quite stable in aquatic systems and can travel significant distances before the compounds break down. In addition to the high toxicity of many metals, especially copper, to aquatic life, cyanide is a potent asphyxiant to fish, the most cyanide-sensitive aquatic organisms. Even at very low concentrations, 0.005 mg/L and 2 mg/L, 'free' cyanide can cause adverse effects (swimming and reproduction) and fatalities, respectively, to sensitive fish species (MWALP, 1991).

Contamination of waterways can also occur when sulphide minerals are abundant in ore, tailings and waste rock. When sulphide minerals, such as pyrite and pyrrhotite, are exposed to air and water (with assistance from ubiquitously present bacteria), acid rock drainage (ARD) is generated. As the highly acidic solution leaches through waste rock or tailings into surface and groundwater, it carries with it dissolved heavy metals, creating a toxic concoction that can decimate aquatic life and riparian vegetation and render it unsuitable for human consumption.

Along the Vetilla River in Bolivia, economic pressures on Catavi Tin Mine operators (COMIBOL) forced the retrenchment of 90% of the workforce (Loayza, 1998). About 10,000 ex-employees of the mine formed cooperatives and continued extraction at the site using ASM methods. As a consequence, contamination of local waters by chemical processing reagents (e.g. xanthates, sulphuric acid, frothers) and direct river discharge of tailings have substantially degraded water quality (Loayza, 1998). Due to acid rock drainage, the pH of the river water ranges between 2.9 and 3.0, which is approximately equivalent to the acidity of pure vinegar.

Other contaminants, particularly domestic wastes and hydrocarbons (e.g. oil, petrol), often contaminate the natural waters around mine sites. As is the case for other industrial activities, diesel and gas used to run pumps, motors and generators and kerosene used for lighting can leak into the soil and subsequently reach ground and surface waters. In addition to the toxic effects of hydrocarbon compounds, metals, such as lead in gasoline, can further degrade water quality. Domestic waste from hastily established, poorly serviced mines sites can also pollute ground and surface water. For example, in 1998, a cholera outbreak in the mining community of Mogrenore, Burkina Faso spread to nearby Ougadougou, causing health officials to examine sanitary conditions in neighbouring ASM communities (Jacques et al., 2002).

3.2 Land Resources

A number of impacts to land resources can result from ASM activities. These include deforestation, degradation of agricultural lands, and incomplete extraction of mineral resources. Each of these has the potential to generate conflict with other land users and compromise the sustainable development of the impacted area. A delicate balance exists between land, water and biological resources, with effects on one compartment often impacting another. For example, in addition to losses in habitat and wood resources, deforestation leads to soil erosion and desertification, as well as siltation of rivers and flooding. The primary land resources affected by ASM include the following:

Forests

In addition to land clearing, deforestation provides timber for the construction of shelters, underground supports, to fashion pans or other ASM tools and for other domestic uses. Furthermore, ASM communities are often heavily reliant on wood and charcoal as a source of fuel.

In Rwamagasa Village, Tanzania, local forests provide timber for a range of domestic and commercial purposes (Tesha, 2003). At the current rate of wood extraction, complete destruction of the nearby forest is expected within the next five years. At Gueguere in Burkina Faso, the shoring of a single 100m by 25m trench consumes almost 30 hectares of forest (Jacques et al., 2002). And in Suriname alone, it is estimated that up to 2300 km² of forest will be destroyed by ASM by 2010 (Peterson and Heemskerk, 2001). Although regeneration of these forests is anticipated as mining activities subside, it has been shown that regrowth tends to be slow due to degradation of soil quality at mine sites (Peterson and Heemskerk, 2001).

In addition to the deforestation caused by miners, informal forestry often takes place in the same regions as ASM. Linkages between these sectors can be strong, particularly in the case of certain mineral commodities. Limestone, for instance, requires large amounts of wood for the production of lime. In the Kasese District of Uganda, where as many as 1000 limestone miners and lime producers are active, a single lime kiln consumes 2 tonnes of wood per tonne of limestone fired resulting in about 20,000 tonnes consumed annually at a single operation (Hinton, 2005). Located adjacent to the Queen Elizabeth National Park, a strictly monitored conservation area, most wood is produced from illegal logging in neighbouring districts, creating severe ecological degradation in those areas. Any efforts to address the ecological damage caused by ASM should also be aware of the nature and extent of interconnections with the forest sector (CASM, 2003).

Agricultural Lands

In Sri Lanka, approximately 500,000 families rely on the gemstone mining industry, most of which are from low income groups (Chandrajith, 2004). Although it provides a means of economic sustenance and contributes to nearly 60% of total mineral revenues in the country, the effects on water and land resources are substantial. Siltation of rivers from gem washing and groundwater depletion has markedly reduced the efficiency of crop irrigation systems (Chandrajith, 2004). Loss of vegetation with land clearing and wood extraction for use as shaft supports have not only degraded flora and fauna, but has reduced the water retention capacity of soils, causing rapid runoff to local rivers and erosion of fertile agricultural soils, both of which contribute to an increased risk of flooding. Mining often takes place in rice paddy fields and precludes their dual use, at least through the duration of mining. This, combined with the loss of agricultural workers to the ASM sector, has significantly affected the agricultural productivity in many regions of Sri Lanka. The widespread damage to land resources has been attributed to factors including limited awareness on the part of miners, lack of legal recourse for people (e.g. farmers) impacted by these activities, and a government predilection for quick economic gains from mining over environmental protection (Chandrajith, 2004).

ASM can also affect agricultural lands through the coating of dust emitted from ASM onto surrounding vegetation. This can lead to pronounced stunting of plant growth and reduced fruit or vegetable production. In addition, aerosol emissions, for instance of sulphur oxides, can be toxic to many plants causing mottling and dead spots (Tan, 1996).

Mineral Resources

Inefficient or inappropriate ASM technologies, resulting in highly mineralized tailings, and the practice of high-grading greatly reduces the potential revenues obtained from mining. In Burkina Faso, artisanal gold miners predominantly work underground quartz veins. Inadequate mechanization, including insufficient pumping means, combined with low cut-off grades due to high operating costs, precludes extraction of much of the ore body. Jacques et al (2002) determined that a typical Burkina Faso operation with a pumping capacity limited to 30 metres depth has a cut-off grade of 20-30 grams of gold per tonne. In some cases, gold grades in excess of 50 g/t remain due to flooding of mine workings (Jacques et al., 2002). In other cases, lack of blasting capacity prevents mining of well-mineralized, massive veins in favour of less competent rock. Processing constraints further result in losses of 40-45% of gold contained in ore.

Loss of valuable minerals to tailings is inconsistent with the best use of a mineral resource. Inefficient processing techniques can lead to recoveries of less than 50%, as is the case in many metallic mining operations. In Burkina Faso, Jacques et al (2002) demonstrated that even if ore (initially containing 20-30 g/t of gold) went through three cycles of grinding and washing, tailings would still yield 8-12 g/t of gold. However, it should be noted that reworking of tailings provides much needed revenue, particularly once the easily extracted ore is depleted.

In many mining sites in the Amazon, fathers leave tailings to the next generation for subsequent re-processing (Veiga, 1997). Often, women, children and the elderly are responsible for reworking the mine waste. In Burkina Faso, where 30-40% of miners are women, the majority of processing (of ore, waste rock or tailings) is undertaken by women in children. In Malaysia, licences to reprocess tin tailings are issued only to women, who use wooden pans (*dulang*s) to recover the low value metal (Cope, 2000). In Bolivia and Peru, *palliris* or *pallaqueos*, respectively, or women (often widows or wives of miners), children and the elderly who supplement their incomes by scavenging small amounts of metal from mine waste, are active at many mine sites (Jerez, 2001; Hruschka, 2002). Although reworking tailings enables the subsistence of many miners, this practice is inconsistent with the principles of sustainable development, which posits that the best use of a resource necessitates use of efficient techniques that provide reasonable recoveries while minimizing both energy consumption and waste generation. Thus, efforts to reduce tailings reprocessing should be cognizant of the employment implications, ideally providing viable livelihood choices concurrently.

General Landscape Degradation

In addition to effects on forest and agricultural resources, degradation of the landscape by ASM can result in aesthetic damage (potentially affecting tourism

and/or the psychological wellbeing of area residents) and may increase risks to health and safety, due to increased landslide potential. Undercutting of sidewalls or hanging walls, irregular pumping, piling of waste rock adjacent to pits and modifications to site hydrology are common causes of land failure (Photo 6).

The causes of land failures cannot, in some cases, be definitively attributed to ASM. On March 31, 2003, a 100m wall of gravel and rock collapsed in gold mining community of Chima, Bolivia. Approximately 400,000 cubic metres of material enveloped three neighborhoods in Chima, roughly 30% of the community. More than 100 people were killed and the community is left with 59 orphans, in addition to the destruction of 149 houses, and the loss of machinery from the Chima Gold Cooperative (Loayza, 2003). Not surprisingly, this tragic event has increased tensions between community residents, a situation aggravated by the lack of clarity concerning land rights and the cause of the event (Gibson, 2003).

After 250 people died and 100,000 people were displaced by a series of landslides in May 2003 in southwestern Sri Lanka, a study on the impacts of gemstone mining on landslides was undertaken by the Rainforest Rescue International and the University of Ruhuna (Lock, 2004). Many factors were investigated as potential causes of the land failures including deforestation (by miners and non-miners), geologic and hydrologic conditions, and land disturbance by gemstone mining. Many residents attribute the landslides, at least in part, to gemstone mining, although deforestation also figured prominently.



Photo 6: Hydraulic Monitoring in Brazil –
Undercutting of Hill Slopes is a Frequent Occurrence
(Photo by J. Hinton)

3.3 Biodiversity

Those working in various facets of the sector infrequently address the impacts of ASM on biodiversity. Due to the significance of biological assets, the protection of biodiversity, particularly in environmentally sensitive areas, should be an important consideration of all ASM projects and programmes. Two very different cases, gold mining in Madagascar and coltan mining in the Democratic Republic of Congo, shed light on the interconnectedness between ASM, vulnerable ecosystems and other natural resource-dependent livelihoods. Although both examples put forth holistic approaches founded in the need to create both awareness and incentives for environmental protection, the unique circumstances surrounding each case highlight the importance of understanding local and regional contextual issues in responding to ecological threats.

Case Study: Gold Mining in Madagascar

In a CASM sponsored project in Madagascar, FANAMBY⁶ is working to identify strategies and actions to increase mining productivity while respecting the integrity of the forest. It is also working with locally authorities to support the creation and management of an institutional mining structure.

The Daraina Region of Madagascar, where FANAMBY is working, is home to one of 20 most endangered primates in the world, the Golden Crowned Sifaka, and this, as well as other ecologically unique factors, has resulted in designation of local forests for conservation (Rajaobelina, 2003). These highest priority conservation areas are also the site of the most productive gold mines in the country, all worked by artisanal and small-scale miners. Inefficient and labour intensive surface mining produces only about 0.5 grams of gold per producer per month, yet activities are widespread. Wildcat pits can reach depths of up to 10 metres and cover large areas resulting in deforestation. Erosion and degradation of surrounding agricultural zones are also consequences of mining activities (Rajaobelina, 2003).

FANAMBY has adopted a multi-faceted approach to address the ecological damage generated by miners. Noting the disparity between Madagascar's mining legislation and the new National Forest Policy, FANAMBY is working to reconcile conservation and mining priorities through both local and regional efforts (Rajaobelina, 2003). One of the primary issues results from the lack of recognition for gold mining as a significant livelihood activity. Consequently, related environmental legislation has not been developed and measures for enforcement of, as well as support for, ASM are virtually nonexistent. Although mining codes have been published, dissemination of this information to local and regional governments is needed.

FANAMBY recognizes that local organizations have a key role to play, both in conservation and mining efforts. Currently three mining associations have been established by FANAMBY and are being supported to develop strategies to improve economic returns through increased productivity while preserving ecological integrity (Rajaobelina, 2003). Working in conjunction with miners

⁶ FANAMBY, which means challenge in English, is a Malagasy NGO working for conservation and development whose mission is to teach communities to manage resources, stop destruction of forest by destructive livelihoods and facilitate private sector participation.

associations, FANAMBY is assisting miners to identify best practices, take responsibility for regional conservation and environmental wellbeing, and educate themselves on community health issues (including HIV/AIDS).

Best practices efforts seek to maintain production at the family level, eliminate the use of environmentally destructive techniques and proliferate the use of acceptable, yet economically viable mining methods. Management of mine reclamation through practices including infilling of pits and revegetation have also been promoted. Mining associations are further being assisted to build their capacity to access the open gold market. In 2003, miners obtained about US\$ 9 per gram for gold, which intermediaries sold to regional buyers for US\$ 15 per gram (Rajaobelina, 2003). By consolidating product from a number of miners, the associations will be able to sell to higher level buyers at a better rate. In addition, the associations may eventually be able to take advantage of “Fair Trade” efforts calling for higher prices for operations employing a high standard of ecological and social practices (see Chapter 9.5).

By creating a culture of community-driven change, management of mine site activities will ultimately be transferred to the mining associations. This will be accomplished through contracts, which require stringent management of sites from start-up through to post-closure. Among criteria related to mining and post-mining practices, contracts will clearly delineate mining zones in accordance with regional management plans (Rajaobelina, 2003). The CASM-sponsored FANAMBY project demonstrates that strong support for mining associations combined with approaches that empower miners at the community-level may be an effective model to address the environmental, legal, social, economic challenges facing the sector.

Case Study: Coltan Mining in the Democratic Republic of Congo

In a study commissioned by the Dian Fossey Gorilla Fund, the impact of coltan mining was investigated in the Kahuzi Biéga National Park, Democratic Republic of Congo (DRC). Located in the eastern province of South Kivu, biogeoclimatically, the Kahuzi Biéga National Park (KBNP) is between an equatorial rain forest and mountainous wet forest. As one of the most biologically diverse ecosystems in the world, it is home to 10,000 species of plants, 131 species of mammals, 226 species of birds, 44 species of reptiles, 30 species of amphibians and numerous species of insects and butterflies (D’Souza, 2003a). Of particular note, 13 species of primates, including gorillas and chimpanzees, reside in the park.

At least seven ethnic groups, mainly forest agriculturalists, fishermen, hunters and foragers, reside in the park. The main sources of cash in the local economies include bananas, in the case of the Bashi people, wood, bushmeat, and cannabis, in the case of Mbuti people (pygmies), and mining, in the case of the dominant ethnic group, the Balega people (D’Souza, 2003a). A coltan (columbite-tantalite) boom between 2000 and 2002 saw the influx of up to 12,000 artisanal miners into KBNP. Most miners were students, teachers, farmers, and soldiers who had abandoned their previous livelihoods in order to extract niobium-tantalum bearing coltan (D’Souza, 2003a).

Coltan mining in KBNP actually commenced in the mid-1990s, when Interahamwe people evading Rwandan and RCD (Rassemblement Congolais

pour la Democratie) enemies sought refuge in the park. A three-way clash ensued with the nationalist Mai-Mai militia joining the fight. When the mineral wealth of the park became evident, the groups conspired to plunder these resources, causing an influx of up to 10,000 villagers (D'Souza, 2003a). With no crops or livestock, these people have subsisted largely on foraging and bushmeat, resulting in the slaughter of all but 2 of 350 elephants living in the park. Soldiers and poachers reportedly claimed tusks, while villagers retained the meat. With the decimation of elephant stocks, villagers turned to gorillas for food, thereby reducing the numbers of Eastern Lowland Gorillas from 258 to 110 between 1998 and 2003 (D'Souza, 2003a). This situation is further exacerbated by the harvesting of bamboo, a main food source for gorillas, by soldiers and villagers.

In addition to the devastation of the wildlife caused by hunting and poaching, the environmental degradation caused by coltan mining has further put this vulnerable ecosystem at risk. Working mainly alluvial deposits using shovels, screens, and crude sluices, most mining takes place along waterways. Coltan mining has resulted in the siltation of rivers, erosion of deforested hillslopes, and downstream hydrologic changes due to loss of moisture-retaining vegetative material from deforestation. Degradation of agricultural lands and forced displacement of villagers for mining and prospecting purposes has also taken place (D'Souza, 2003a).

Prior to extensive conflict-driven ASM activities, the indigenous people in the KBNP lived somewhat harmoniously with the forest and its other inhabitants. Since the insurgence of military forces in the mid-1990s, the ongoing presence of soldiers engaged in illegal mining and poaching, as well as the recruitment of local youth from agriculture and the forced evacuation of agricultural lands and confiscation of livestock continues to pose significant threats to food, economic and personal security (D'Souza, 2003a).

With consideration that current opportunities to return to their traditional livelihoods are limited and a moratorium on mining in the park is unlikely to be enforced, D'Souza has recommended an incentives-driven, sustainable ASM sector outside of the park boundaries. In order to facilitate this, the following measures have been suggested (*after* D'Souza, 2003a):

- Determination and delineation of mineral potential appropriate to ASM outside the KBNP;
- Establishment of a formal, government-housed ASM unit;
- Formulation of an enabling, appropriate and transparent regulatory framework and licensing scheme;
- Provision of extension services, including assistance and training in mining technologies, health and safety, and environment and support for the development of mining organizations (e.g. associations, cooperatives);
- Institution of an ASM microfinance programme;
- Development of a fair marketing system for mineral commodities; and
- Establishment of reasonable and suitable environmental protection practices.

In order to ensure that a response programme is holistically responsive to the reality faced by artisanal miners currently active in KBNP, the participation of all stakeholders throughout programme development and implementation is strongly recommended. It is evident that enticing miners from the KBNP will not be an easy process; however, given the significance of the park in terms of its biodiversity, this is certainly a goal worth pursuing.

Throughout the world, ASM takes place in biodiversity “hotspots”, defined as the “the richest and most threatened reservoirs of plant and animal life on earth” (Conservation International, 2005). In addition to vulnerable ecosystems in Madagascar and DRC, these include the Amazon Rainforest and tropical Andes in Latin America, the greater part of the Philippines, the forests of Sri Lanka, and the “Succulent Karoo” region of South Africa and Namibia.

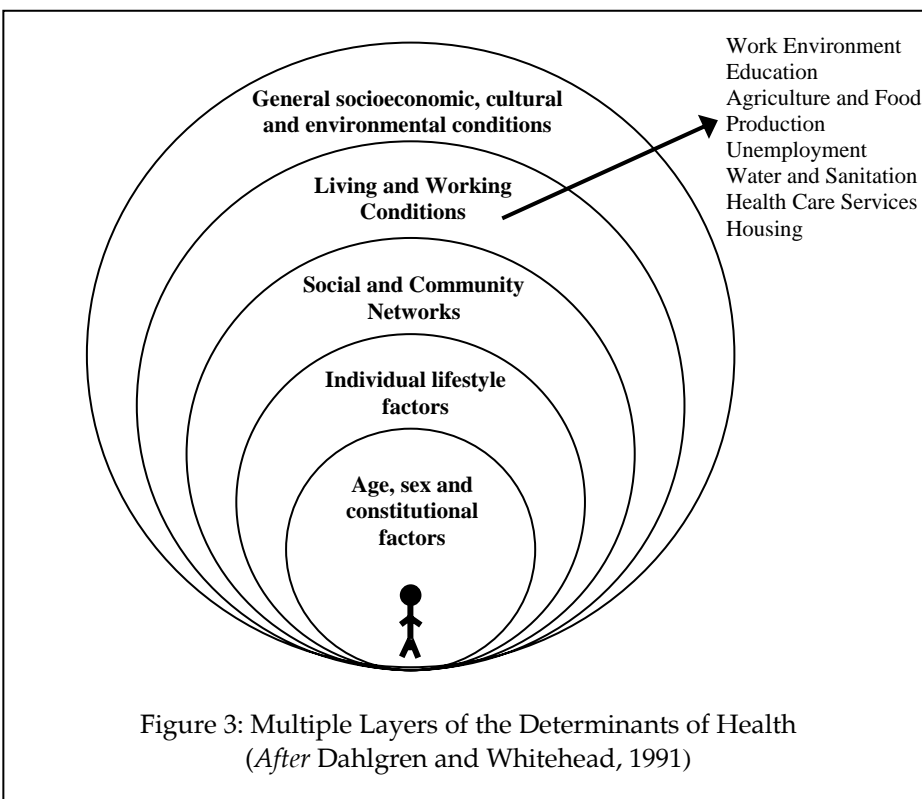


Photo 7: Environmental Degradation caused by ASM in the Amazon
(Photo by M.Veiga)

Degradation of the natural environment by ASM activities is a major constraint to sustainable development in affected areas. On a local level, many livelihoods directly rely on the integrity of the environment for their survival. Globally, a resilient natural environment provides the foundation for strong economies, diverse livelihoods, vibrant culture, good health and, in many cases, a peaceful existence. As a key pillar of sustainable development, environmental protection must also be a primary consideration in strategies to advance the ASM sector. Recognition of the vital role played by the natural environment, and in particular, biologically sensitive ecosystems, is critical to the wellbeing of humanity on a local, regional and global level.

4 ASM AND HUMAN HEALTH

The World Health Organization (WHO) defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity.” It has been well established that the links between health and wellbeing of men, women and children is a function of a complex interplay of social, cultural, ecological, occupational, political and economic factors. In the context of ASM, a comprehensive understanding of the impacts and benefits of ASM on health therefore requires awareness of its effects on factors such as income level and disparity, social support networks, education, employment, working and living conditions, physical environments, social environments, biology and genetic endowment, personal health practices, coping skills, healthy child development, health services, gender and culture (Fig. 3).



Understanding the interconnectedness between human health and these multiple determinants has increasingly been recognized as critical to effectively promoting human development. In their in-depth exploration into the concept of sustainable development in 1987, the Brundtland Commission highlighted the sensitivity of human health to environmental change. At the ensuing Earth Summit in Rio de Janeiro in 1992, the United Nations Commission on Environment and Development (UNCED) further espoused the importance of characterizing the relationships between human health and environment, poverty, socio-economic conditions, and development. More recently, the convergence between health and development was discussed at the World Summit on Sustainable Development in Johannesburg during which the World Health Organization (WHO) was charged with developing an action

plan on health, the environment and development. Finally, the Millennium Development Goals (MDGs) “commit the international community to an expanded vision... that promotes human development as the key to sustaining social and economic progress.”⁷ Commonly accepted as a framework for measuring development progress, the MDGs are comprised of eight clearly defined goals, each of which directly or indirectly relies on human health and wellbeing (Appendix Two).

CASM has recognized that the advancement of ASM relies on marked improvements in the human health and wellbeing of miners, affected communities and other ASM stakeholders. Primary issues addressed at Learning Events and AGMs relate to occupational health and safety, environmental health and community health. Many of these issues coincide with the human health and development objectives of multiple donors, health-based organizations, government agencies and others; thus, they can serve as points of entry for collaboration to overcome these critical challenges. Key entry points include HIV/AIDS and malaria, occupational exposure to harmful chemicals, environmental integrity, and public infrastructure and services (i.e. water and basic sanitation), each of which has the potential to affect child and maternal health (MDGs Five and Six, respectively).

4.1 Occupational Health and Safety

Mining – both small and large-scale, formal and informal – is one of the most occupationally hazardous activities in the world. In addition to injuries and fatalities from accidents, miners experience high rates of cancer, respiratory illnesses and other diseases (Stephens and Ahern, 2001). The occupational health issues that plague ASM can primarily be attributed to its informal and often illegal nature, economic demands that result in inadequate equipment and neglect of safety measures, a frequent lack of expertise and insufficient training.

Most occupational hazards are a consequence of poor physical conditions, such as ground failure and shaft collapses although machinery accidents, poor lighting and ventilation, electrocution and explosives misuse are also pervasive issues (ILO, 1999). Women, men and children who work in ASM face additional illness, injury and stress from dust and noise pollution, extreme exertion from highly labour-intensive jobs and stress caused by economic and other pressures (Hentschel et al., 2001). Although accidents are underreported due to the illegality of ASM, ILO (1999) states that non-fatal accidents in ASM are still six to seven times greater than in formal, large-scale operations.

Ground Failure and Rock Falls

Ground failures and rock falls are mainly attributed to undersized pillars, poor supports of underground workings, overly steep pit walls, undercutting of sidewalls or hanging walls, irregular pumping and piling of waste rock adjacent to pits. Modifications to site hydrology, for instance through diversion of rivers down hillsides for use in processing, can also induce ground failure.

⁷ Millennium Development Goals, www.developmentgoals.org.

The “induced erosion” of pit walls in hydraulic monitoring of secondary deposits also significantly increases landslide potential.

Injuries and fatalities from ground failure and rock falls are startlingly common in ASM. In only two ASM sites in Indonesia, shaft or pit collapses occur between 2 and 5 times per year (Purwana, 2003). One of the most tragic examples of ground failures occurred on March 31, 2003, in Chima, Bolivia. A 100-metre high wall of gravel and rock, approximately 400,000 cubic metres of material, enveloped three neighbourhoods in Chima, roughly 30% of the community. More than 100 people were killed and the community is left with 59 orphans, in addition to the destruction of 149 houses and the loss of machinery from the Chima Gold Cooperative (Loayza, 2003).

Despite the frequency and potential magnitude of ground failures in ASM, efforts to eliminate, prevent or minimize their risks have been quite marginal.

Equipment or Mechanical Accidents

Particularly underground, where lighting is often poor, accidents related to machinery and mechanical malfunctions, electrocution, and explosives misuse are frequent but highly underreported. Miners are more prone to accidents when they lack caution in their practices, the risk of which increases with intoxication with drugs or alcohol (Tan, 2000).

Machinery often does not receive the maintenance and use of protective measures (e.g. safety guards around moving parts) needed to prevent related accidents. Even when rudimentary tools and equipment are used, such as sledgehammers, pickaxes and crowbars, accidents caused by their misuse can result in significant harm. As many ASM communities lack on-site first aid equipment and health clinics are often located great distances from mining communities, even a small wound caused by a misplaced hammer stroke or shrapnel from rock breaking can, left untreated, progress into infection.

Proper storage, handling and use of explosives are critical to the health and safety of miners working at ASM sites where blasting is undertaken. Unintended detonation of explosives or improper loading of charges has the potential to cause death by direct exposure to the blast or from cave-ins. In June 2002, 37 miners were killed when an electrical fire ignited explosives in a gold mine in Shanxi Province, China (Gunson, 2004). Unregulated use of explosives, particularly by untrained miners, presents a serious cause for concern. A Blasting Certificate of Competency Course has been initiated in South Africa and could serve as a model for other countries (CASM, 2003).

Noise and Vibration

Frequent or extended exposure to loud noise can result in hearing impairment. Exposure can occur when miners are working with or in close proximity to machinery (mills, compressors, drills), blasting, and picks and hammers. Although ILO (2001) recommends use of ear plugs or muffs at levels above 90 dbA, it can be assumed that most of these sources emit sufficiently excessive noise to warrant use of protective gear. Irreversible, noise-induced hearing loss can occur once noise levels are sufficient to interfere with spoken communications (WHO, 2002).

Repeated and prolonged exposure to vibration through the use of hand held machinery can produce pain and numbness in the hand and arm. Even exposure as brief as one hour daily can produce harmful effects, including a condition called “vibration white finger” (VWF) that commences with numbness progressing to loss of feeling and potentially gangrene (ILO, 2001). Use of low-vibration equipment, decreased operation times, and employment of a relaxed grip on equipment handles can reduce the harmful effects of vibration (ILO, 2001).

Methane Explosions

Methane gas and coal dust explosions are serious hazards in small-scale, underground coal mines throughout the world. Particularly in China, where ASM produces 11% of the world’s coal, more than 6,000 coal miner fatalities are recorded annually, mainly due to underground explosions of methane (Gunson and Yue, 2001). With the Chinese Government making great efforts to shut down the illegal mines, these miners receive little support for safer practices.

Mercury in Gold Mining

One of the most studied health aspects of ASM, mercury misuse, poses a serious occupational hazard to gold miners. Although exposure results through handling without gloves, especially during manual amalgamation, the most significant exposure pathway is inhalation of mercury vapour released during amalgam decomposition.

In many countries, decomposition (burning) of the mercury-gold amalgam takes place using shovels or metal pans in small sheds adjacent to processing sites or in the home, using the kitchen stove. Typically, the risk of exposure is greater when burning is conducted in confined spaces or the miner, or other observers (e.g. the miner’s family), are in close proximity to the amalgam during burning. Chronic exposure to mercury vapour can cause gingivitis, muscular tremors and psycho-pathological symptoms, such as depression and exaggerated emotional responses. In the case of the latter, mercury poisoning is difficult to diagnose as it can easily be confused with alcoholism, fever, malaria or other tropical diseases. Exposure to acute levels of mercury vapour can produce dysfunction of the kidneys and urinary tract, vomiting, and, in the most severe cases, death (Stopford, 1979).

Countless studies have demonstrated that gold miners, particularly those involved in amalgam burning, are at a high risk of mercury poisoning. In the Mt. Diwata region of the Philippines, 73.5% of mine workers exhibit signs of mercury intoxication (Boese-O’Reilly, 2004). In Dumasi, Ghana, more than 50% of miners and 25% of non-miners are considered heavily intoxicated with mercury (Bernaudat, 2003). In Tatelu, Indonesia, using a standardized test, the frequency of dysdiadochokinesia, which is the decreased ability to do rapid alternating movements, is about 35% in children working as miners, compared to about 22% in non-mining children from the ASM community and <10% in children from a control community (Boese-O’Reilly, 2004).

Even when detailed mercury exposure assessments are not conducted, it is safe to assume that, given the employment of similar processing methods, the risks to miners are considerable. Reduction in the use of mercury through

improvements in technical processes can markedly lessen exposure. However, the use of retorts in amalgam burning is commonly recognized as a key measure to decrease occupational health risks.

A retort is a container in which the gold-mercury amalgam is placed and heated; volatile mercury travels up through a tube and condenses in an adjacent, cooler chamber. When used properly, more than 90% of mercury in the amalgam can be recovered and, following cleaning, reused for subsequent gold processing (Wotruba, 2003). Although they are relatively easy to construct and operate, they are not in widespread use. Main barriers to the use of retorts include (*after* Wotruba, 2003, Hinton et al., 2003):

- Lack of awareness of the existence of retorts;
- Lack of awareness of or priority given to the effects of mercury;
- Lack of access to materials for retort construction;
- Gold is not visible during burning⁸;
- Unsuitable for very small amounts of amalgam;
- Requirement for higher energy heat sources, which are not always available;
- More complicated and time consuming than open-air burning; and
- Gold often comes out dull and grey.

A variety of types of retorts have been promoted in ASM projects by organizations including CETEM, Projekt-Consult GmbH, Intermediate Technology Development Group (ITDG) and the Organization of American States in countries throughout the world. Most recently, UNIDO has been investigating the use of retorts constructed of commonly available materials (e.g. stainless steel bowls available in local markets)⁹.

Cyanide in Gold Mining

The efficient and safe use of cyanide requires strict maintenance of certain operating parameters. Unless cyanide solutions are maintained under extremely basic conditions (pH >12), harmful hydrogen cyanide gas (HCN) is released. An effective asphyxiant, hydrogen cyanide gas can be fatal to humans at relatively low concentrations (around 250 ppm or 276 mg/m³ at 25°C) in air. Although the ingestion or inhalation of cyanide can be fatal¹⁰, related deaths in ASM are rare (Holloway, 1997). Chronic exposure to low concentrations of cyanide has been linked to neuropathological lesions and optical degeneration (Potter et al., 2001).

Although miners using cyanide are generally aware that the solution must be extremely basic (i.e. at high pH), monitoring of pH levels is uncommon. Many miners simply add excess lime to increase solution alkalinity. Sodium and

⁸ Thermex glass retorts have been promoted by UNIDO in a number of countries. As they easily break and require specialized parts for replacement, they are suitable for demonstrations but not widespread dissemination.

⁹ Information on the UNIDO Global Mercury Project, including their efforts in building and distributing alternative retorts can be found at www.unites.uqam.ca/gmf/intranet/gmp/front_page.htm.

¹⁰ Hydrogen cyanide gas (HCN) (which is generated when solution pH falls below ~11) can be fatal to humans at concentrations ~250 ppm (276 mg/m³ at 25°C) in air. Ingestion of cyanide in solution (CN-) can induce death at about 1 to 3 mg of cyanide per kg of body weight (Lodgson et al., 1999).

calcium hydroxide are also effective at increasing pH, but they have been shown to inhibit gold dissolution. In the Kadoma-Chakari region of Zimbabwe, miners add 50 kg of calcium hydroxide ($\text{Ca}(\text{OH})_2$) to every tank containing 18 kg of sodium cyanide and amalgamation tailings (Hinton and Veiga, 2004).

Dust and Fumes

Fine mineral particles, or dust, are generated from drilling and blasting, loading and hauling, and crushing and grinding (ILO, 2001). The inhalation of fine mineral particles can result in the accumulation of scar tissue in the lungs. As this occurs, lung capacity decreases and the victims slowly suffocate. In some cases, the presence of foreign material in the lungs can result in cancer. Silicosis and pneumoconiosis, generated from inhalation of crystalline silica dust emitted from blasting or breaking and crushing rock, are the most frequently reported respiratory effects. Conditions resulting from silicosis include emphysema, lung fibrosis and silica-tuberculosis. In mining areas of the Bolivian Altiplano, the low life expectancy (48 years compared to a national average of 63 years) has been mainly attributed to silicosis and, in Ghana, silicosis has been documented in children as young as 14 (ILO, 1999, Quiroga, 2000). Silicosis and pneumoconiosis (caused by inhalation of dust from a range of minerals) reportedly effects more than 12% of coal miners (large and small-scale) throughout the world (Stephens and Ahern, 2001). And in a single mine in Jianzi Province, China, the death of more than 100 miners, roughly a quarter of the workforce, was attributed to silicosis (Becker, 2004).

Other respiratory problems, including asthma, chest infections and chronic bronchitis are frequently reported by artisanal and small-scale miners and are largely due to the inhalation of irritants.

Dust emissions in underground mines are often worse than in surface mines, as evidenced in Merelani, Tanzania, where graphitic particulate was measured at 6,830 mg/m^3 underground compared to 252 mg/m^3 at surface (Tan Discovery, 1996). The ILO (2001) recommends that exposure to dust be minimized through the use of dust masks, wet drilling methods, and water sprays throughout hauling, loading, crushing and grinding.

Fumes released during blasting, from combustion engines (diesel, petrol) and even kerosene used in lighting can also result cause serious health effects. Gases such as carbon monoxide (CO), carbon dioxide (CO_2), nitrogen and sulphur oxides (NO_x , SO_x), can be fatal in high enough concentrations. Chronic exposure to carbon monoxide, a common by product of combustion engines, can result in headaches, delayed neurological damage, reduced coordination, nausea and vomiting (WHO, 2000a). In addition, the decomposition of wooden underground supports can generate highly toxic hydrogen sulphide gas (H_2S), which can cause chronic headaches, fatigue, anxiety and loss of concentration at lower levels in air ($>30 \text{ mg}/\text{m}^3$), serious eye damage at concentrations above 70 mg/m^3 and central nervous system damage and risk of death at concentrations above 450 mg/m^3 (Tan, 2000, WHO, 2000b).

In Sri Lankan gem mines, underground miners often use candles or kerosene lamps for illumination and to identify toxic gases (Dharmaratne, 2004). However, these can increase carbon monoxide levels in the mines, leading to

health problems, and may not provide sufficient lighting for the identification of some gem varieties. Battery powered lamps have been recommended to the miners by the Sri Lankan Gem and Jewellery Research and Training Institute. In general, ensuring adequate ventilation in underground workings and sites where machinery is operating can reduce the risks of exposure to fumes (ILO, 2001).

Extreme Physical Exertion

Heavy loading, uncomfortable body positions and repeated movements can cause a number of injuries to the upper and lower back, neck and limbs (ILO, 2000). Although rarely fatal, chronic pain can limit work, recreational and domestic activities (WHO, 2002). Activities such as digging, lifting and hauling, particularly of heavy weights, can result in injury, stress and fatigue. Risks are greater when miners rely on highly manual techniques - breaking rocks with hammers and chisels, mucking and loading with shovels and hauling with simple buckets or bags. Children engaged in these activities are particularly vulnerable as damage to their musculoskeletal systems can impair their growth and development (Wasserman, 1999).

Stress

Factors such as heavy workload, poverty, and family illness are also expected to negatively impact the mental and physical health of women and men. Further to this, the effects of migration may also weigh heavily on the psychological well-being of miners and their families, particularly when it is often related to poverty and economic crises in their homelands. In some cases, women miners migrate to mining areas for periods of time, leaving their children in the care of relatives (Heemskerk, 2000). Although evidence indicates that there is a strong link between mental and physical health (WHO, 2001), indicators of mental health or stress have not been studied in the context of ASM.

Responding to Occupational Health and Safety Risks in ASM

Due to these occupational hazards, the fatality rates in ASM are up to 90 times higher than in large-scale mines in industrial countries (Elias and Taylor, 2000). Many organizations (ILO, UN agencies, NGOs, etc) are working to increase the capacity of artisanal and small-scale miners to work in a safe environment. Knowledge building, training and financial resources are key issues.

Assessing occupational health and safety risks is critical to establishment of appropriate measures for mitigation. A key component of an occupational health programme in the ASM community of Huenca, Peru, was a critical evaluation through risk mapping, and examination of risks for current and future generations (Lujon, 2002). This was supplemented by studies on food security and exposure risks from gold mining chemicals (i.e. mercury). Contemporaneous programmes included an accident registry, sensitization on health risks and validation of risk-reducing mining methods. In order to develop a "culture of prevention", local promoters were trained in risk prevention. The community capacity was further strengthened in strategic planning, self-sufficiency and entrepreneurialism (Lujon, 2002).

Following the tragic event in Chima, Bolivia, the International Development Research Centre of Canada (IDRC) and the Latin American Programme of Science and Technology for Development (CYTED) have approached the United Nations Environment Programme (UNEP) in an effort to develop a framework for Awareness and Preparedness for Emergencies at the Local Level (APELL) in ASM. Development of an APELL appropriate for the ASM would mark an important step towards addressing the health and safety issues facing both miners and affected communities.

In response to the numerous occupational health and safety risks facing artisanal and small-scale miners, a handbook on “Safety and Health in Small Scale Surface Mines” was issued by the ILO in 2001¹¹. Following principles of first eliminating, then controlling and minimizing risks, all combined with the use of personal protective equipment, the book acknowledges the responsibility of every miner at a site, individually and cooperatively, in contributing to good health and safety standards (Walle and Jennings, 2001). Guidance is provided on the following topics:

- Mining accidents and dangerous occurrences;
- Hazards in the working environment;
- Health, welfare and hygiene of mineworkers;
- First aid;
- Personal protective equipment;
- Safety when mining;
- Mechanical equipment;
- Explosives and blasting; and
- Mine closure.

As one of the most practical and widely disseminated guidebooks on this topic (it is available in 12 languages), the manual provides an excellent model for training material directed towards ASM. It should be noted that guidebooks are clearly needed; however, widespread dissemination of this material and hands-on training of miners is also critical to advancing positive change on this issue. As stated by one artisanal gold miner in Uganda “*Miners don’t want to read books or reports. They want to see it and do it with their hands* (Anon, 2005).” A sustained, on-the-ground effort to address the occupational health and safety challenges in ASM is clearly needed. Government authorities, NGOs, communities, academia and others who are conducting broad-based ASM assistance programmes have an important role to play; however, in many cases, the capacity of these parties to undertake this work must also be developed.

4.2 Health and the Natural Environment

In informal economies in particular, the natural environment is critical to people’s abilities to generate income and satisfy household needs. The quality of the natural environment impacts the quality and quantity of water and food

¹¹ The “Safety and Health in Small Scale Surface Mines Handbook” can be accessed at <http://www.ilo.org/public/english/dialogue/sector/papers/mines/handbook.pdf>

and is further relied upon for biomass fuels, medicinal plants and resins. Due to the direct link between human health and the natural environment, numerous ASM efforts have sought to characterize and mitigate the environmental impacts of mining, thereby reducing negative effects on human health status.

In addition to the health effects caused by the disruption of non-mining livelihoods, for instance, through negative environmental impacts on agricultural lands or fisheries (both of which can compromise food security), a number of adverse effects from exposure to pollutants in air, water, soil and noise can be generated by ASM. Important environmental health issues to consider include:

- Exposure to heavy metals via ingestion of contaminated food or water;
- Ingestion of heavy metals in soils (by children);
- Inhalation of dust, fumes and other air pollutants;
- Reduced availability of water suitable for consumption or agricultural purposes; and
- Exposure to excessive and/or prolonged noise levels.

Water

Heavy metals (e.g. lead, cadmium) and chemicals such as cyanide, emitted into ground or surface waters from mining activities are generally the most critical environmental exposure pathways for humans. ASM communities often have little choice with respect to their drinking water sources and may be unaware of the health implications or reasons for poor water quality.

Accidents that occur during the transport, handling and use of cyanide can result in significant damage to aquatic systems. Cyanide concentrations in most Canadian gold mining effluents range between 0.3 and 30 mg/l – an important consideration given that a lethal dose for humans occurs at 3 to 5 mg of free cyanide per kilogram of body weight and sensitive fish species die at concentrations as low as 0.05 mg/l (Veiga, 2003). Although most forms of cyanide break down (photodegrade) over time to carbon dioxide and nitrogen gas with exposure to air, sunlight and high temperatures, when it is associated with certain metals (e.g. iron, mercury, cobalt), it can remain relatively stable in water. In addition, the absence of oxygen and sunlight in groundwater systems suggests that human exposure through ingestion of water from boreholes or wells may present a significant risk.

In or en route to the small gold mines of China, there have been at least three major cyanide spills, most related to accidents involving their transportation. In 2001, 11 tonnes of sodium cyanide leaked into the Luohe River in Henan Province, while in 2000, 5.2 tonnes of sodium cyanide was spilled into the Wuguaan River in Shanxi Province (Gunson, 2004). Although no human fatalities were reported, fish deaths in these rivers were extensive.

Arsenic releases by mining operations present a major human health hazard in certain regions. In Bolivia, for instance, 318,000 tonnes of arsenic trioxide was mined, mainly by small-scale producers, in 2000 (Bocangel, 2001). Often found in association with copper, gold and other metals, arsenic primarily enters

aquatic systems as a result of arsenopyrite (FeAsS_2) oxidation, therefore, although certain forms of arsenic are soluble under alkaline or neutral water conditions, acid rock drainage often contributes to its mobility in water systems. In the gold mining regions of the Ankobra River basin in Ghana, arsenopyrite-rich waste from small-scale mines has resulted in extensive pollution of the Ankobra River (Bannerman et al., 2003). The industrial influence of the arsenic pollution can be measured as far as 100 km downstream from mining, presenting a risk to all communities reliant on river water for consumption. In Chile, where small-scale miners generate only a small proportion of production (3% copper and gold; 0.4% silver), arsenic naturally occurs in high concentrations, particularly in association with copper. As a consequence, the direct discharge of tailings to local waters has resulted in extensive arsenic pollution (Environment Canada, 1996).

Chronic exposure to arsenic through ingestion can lead to hyperpigmentation (darkening of the skin), depigmentation (loss of pigment), keratosis (abnormally light sensitive skin lesions) and peripheral vascular diseases, as well as various cancers (bladder, lung, skin) (WHO, 2001). The effects of arsenic poisoning are severely exacerbated by other health problems, including Hepatitis B or malnutrition.

In addition to chemical effects, ASM can generate hazards in terms of physical impacts also. For example, dewatering of underground mines and large pits can lead to a drop in the groundwater table, resulting in impacts to local agriculture and drinking water sources.

In a number of the GMP-target communities, abandoned pits have been described as veritable “death traps.” In Rwamagasa Village, Tanzania, abandoned pits reach depths between 2 and 20 metres while in Galangan, Indonesia, depths typically range from 5 to 50 metres (Tesda, 2003, Purwana, 2003). Animals and people walking in these areas, particularly at night, have been known to fall into pits and drown during the wet season when pits are covered by thick grasses. Flooded pits have also been shown to provide breeding grounds for mosquito-borne diseases, such as malaria.

Soil

Due to fallout of dust from mining activities, hand-to-mouth ingestion¹² of lead-bearing soils by children has resulted in high blood levels in lead-zinc-copper mining areas (Gulson, 1996). Accumulating in the kidneys, liver and bones, lead is more likely to accumulate in undernourished children, resulting in impaired brain development which leads to behavioural problems and decreased intelligence (WHO, 2005). As lead accumulated during childhood can be released during pregnancy and lactation, this creates further concern for the wellbeing of future generations. Mother to foetus transmission of lead can increase the cause miscarriages, low birth weight and premature birth (WHO, 2005)

¹² Young children are particularly susceptible to increased exposure to a number of contaminants as they crawl on the ground and tend to eat non-food items, such as soil. In addition, relative to their size, children breathe more air, consume more food and drink more water than adults (WHO, 2005).

Reworking of mine tailings, which is commonly the domain of women and children, may result in simultaneous exposure to multiple pollutants. For instance, the *palliris* in Bolivia may spend several hours per day working in tailings saturated with heavy, metal-rich acidic drainage and cyanide residues (Jerez, 2001). Exposure to cyanide can occur through ingestion, inhalation or absorption through skin (WHO, 2004). Although residual cyanide, may not be present in sufficient concentrations to induce death, chronic exposure to low levels has been linked to neuropathological lesions and optical degeneration (Potter et al., 2001). As hand-to-mouth transmission of soil pollutants is expected in young children, ingestion of highly toxic metals, including lead, cadmium and arsenic, creates a further health risk.

Air Pollution

Air pollutants, including dust and fumes, have been shown to increase the prevalence of respiratory illnesses in residents living in close proximity (particularly downwind) of mining activities. With the exception of mercury emitted from gold mining, the bulk of the work on health effects from air pollution in mining has emerged from the large-scale, formal sector. However, given the relative crudeness of technologies used and difficulty in regulating air emissions from ASM, it can be expected that effects from artisanal and small-scale mineral extraction, processing and smelting would be similar to the large-scale sector. However, it is important to note that the “loading” of pollutants, or the total amount emitted to the environment, is a significant determinant of the adverse affects on populations. The fact that many small-scale operations may release comparatively less air pollutants (per unit volume), therefore, should be considered.

Dry crushing and grinding and wind erosion of mine tailings and crushed ore can increase particulate in the air. As a consequence, people living or working around mills or mine sites are frequently exposed to a significant amount of dust. Even non-miners are, therefore, susceptible to the similar respiratory illnesses as mine workers (e.g. silicosis, pneumoconiosis). However, the risks generally decrease with proximity to dust sources. Respiratory illnesses, including “wheezing in the chest” and ear, nose and throat problems, has been reported in children living around large-scale, open cast coal mines in the Gardanne coal basin in France (Charpin et al., 1988). A significant increase in respiratory symptoms was correlated with sulfur dioxide (SO₂) emissions from coal firing.

Mercury released during amalgam decomposition in gold mining has been demonstrated to effect residents living in close proximity to burning sites. Whether during initial burning or subsequent smelting of the doré (which still contains about 2% mercury) in gold shops, the cumulative exposure to high levels of mercury vapour can adversely effect local populations (Veiga and Hinton, 2003). If used, fumehoods are typically crude devices, often consisting of a fan that emits vapours into the outside environment. Most volatilized mercury settles near emission sources. In Alta Floresta, Brazil, deposition of mercury emitted from 32 gold smelting shops was within 1 km of the source (Marins, 1991; CETEM, 1991). As burning of mercury takes place at a relatively low temperature (about 400°C), it is probable that most mercury vapour does not reach high altitudes and is re-deposited within 2-3 km of the emission site (Borochoff, 2001). The symptoms of mercury intoxication from environmental

exposure are the same as those for occupational inhalation, including muscle tremors, psycho-pathological disturbances and kidney problems.

Biota¹³

Metals and other contaminants from mining activities are primarily released into the environment through the erosion, leaching or dumping of tailings, waste rock or effluent or through atmospheric emissions. In the environment, metals may be transformed into bioavailable forms, meaning they can be readily assimilated by biota. Uptake of metals into the food chain can be facilitated through ingestion of ground and surface water, fallout (dust) onto agricultural crops or natural waters or through direct uptake from tailings into crops or grazing animals (Fig. 4). Application of contaminated irrigation water to crops has further been recognized as an important exposure pathway. Humans reliant on contaminated food or water may be vulnerable to the risk of exposure to harmful levels of contaminants.

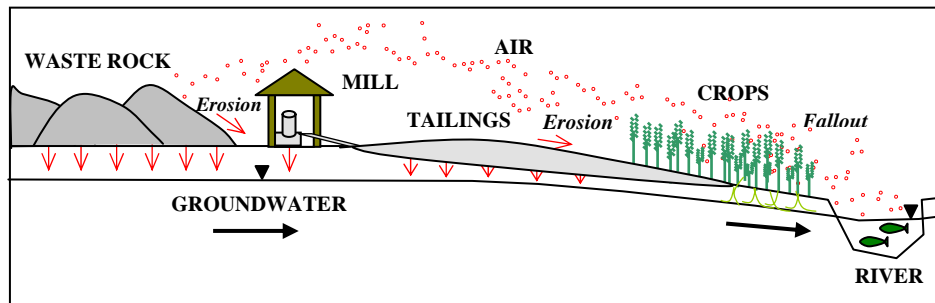


Figure 4: Important Environmental Exposure Pathways

Food chain transfer of heavy metals, such as lead and mercury, can generate a host of adverse health effects. Chronic exposure to cadmium through ingestion of contaminated food can have effects that include kidney stones to osteomalacia, a form of rickets (WHO, 1996). In Korea, heavy metals including lead, cadmium, zinc and copper released from nearby mining activities had accumulated in local rice crops, creating an increased health risk to local rice consumers (Jung and Thornton, 1997). In an assessment of women living near lead mine waste, consumption of home-grown produce was linked to blood lead concentrations that were 28% higher than non-local produce-consuming women (Gallacher et al., 1984).

Due to its widespread misuse in gold mining, combined with its capacity to biomagnify (i.e. increase in concentration) up trophic levels of the food chain, the majority of environmental exposure assessments in ASM have focused on mercury. Once in the environment (air, water, tailings), metallic mercury discharged by artisanal and small-scale gold miners can be transformed into methylmercury, a readily bioavailable form of mercury. Certain conditions in aquatic systems (e.g. low pH, high organic matter) may be particularly conducive to mercury methylation, In these cases, carnivorous fish, which are those most frequently consumed by humans, tend to be most contaminated (Veiga et al., 1999).

¹³ *Biota* refers to all of the living organisms in a given ecosystem, including microorganisms, plants and animals.

Chronic exposure to moderate levels of methylmercury results in symptoms including: visual constriction; numbness of the extremities; impairment of hearing; impairment of speech; and impairment of gait (Murata et al., 2000, Deitrich, 2000). In cases of acute intoxication, muscular atrophy, seizures and mental disturbance are prominent. Women of childbearing age and their children are particularly susceptible, as methylmercury readily crosses placental barriers and is considered to be a developmental toxicant (Grandjean, 1999). Depending on the frequency and degree of exposure, effects can range from sterility, and spontaneous abortion, to mild to severe neurological problems (e.g. learning disabilities).

Understanding the fate of mercury released by gold miners is critical to preventing and mitigating the environmental health risks. A CIDA sponsored project in Guyana, presented at the 2003 CASM AGM in Ghana, described an extensive mercury sampling programme in fish, water, sediment and tailings. Mercury concentrations in water were comparable to those in non-mining impacted sites, while levels were highest in association with fine soils (clay and silt) and mud (Couture, 2003). Thus, the erosion of mercury-associated fines into waterways, where has an increased likelihood of transformation to methylmercury, provides a primary means for its incorporation into the food chain. Carnivorous fish exceeded the WHO recommended level (0.5 µg/g), resulting in an increased risk for communities downstream from mining (Couture, 2003).

As part of a large UNIDO project to reduce mercury exposure in Dumasi and Japa, Ghana, a comprehensive assessment of risks from mercury was conducted. A preliminary evaluation conducted in the village of Dumasi in 1999 demonstrated that borehole, surface and well water was not significantly impacted; however, all fish samples taken exceeded WHO guidelines (Bernaudat, 2003). Tests indicate that 50% of miners and 25% of non-miners in the community are heavily intoxicated by mercury, demonstrating that environmental, as well as occupational, exposure pathways are affecting local populations. In Japa, where hair, blood and urine samples were taken from 180 miners and non-miners, environmental contamination was far less prevalent than Dumasi (Bernaudat, 2003).

One of the most controversial topics related to artisanal and small-scale gold mining relates to whether the impacts of mercury misuse extend beyond local levels to affect regional and global ecosystems. Using standardized tests for mercury intoxication, Boese-O'Reilly (2004) demonstrated that the occupational mercury burden is high, with 73.5% of mine workers tested exhibiting signs of intoxication in the Mt. Diwata region of the Philippines. Despite this, downstream residents who rely on river water for irrigation and drinking are impacted to an even greater extent, with 73.7% affected. These results are significant, not only in terms of the startling differences when compared to control populations, (where 16.7% had symptoms of toxicity), but they also provide evidence of regional effects in this setting. Regardless of whether the impacts of mining are global, regional or local, it is evident that efforts must be taken to reduce health risks experienced by vulnerable populations.

Noise

Living or working in close proximity to mining and milling operations often equates to exposure to excessive noise. For instance, in Rwamagasa Village, Tanzania, Tesha (2003) ascertained that the noise levels for millers and those living in close proximity to mills were sufficiently high to cause hearing impairment.

Responding to Environmental Health Risks in ASM

A number of programmes and projects have targeted improvements in environmental impacts of ASM. In response to a baseline survey of ASM in Tanzania, a comprehensive series of five training manuals were developed and disseminated to miners¹⁴. Supported by a broad-based Mineral Sector Development Project, the manuals are comprised of five volumes spanning regulations, geology, mining and mineral processing methods and health, safety and environment. The manuals provide clear and simple guidance to miners in an effort to improve economic, environmental and social outcomes from ASM.

With respect to environment, Volume Five in the series addresses (Tan Discovery, 2000):

- Environmental management;
- Environmental impact assessment;
- Environmental monitoring and auditing;
- Mine closure;
- Water management; and
- Refuse management.

A follow-up evaluation on the efficacy of the manuals in improving practices has not been conducted. Nevertheless, although specifically developed for Tanzania, these guidance materials can serve as a model for the development of similar training materials in other ASM contexts.

Endeavours such as this, coupled with explicit consideration of environmental management in Tanzania's Mineral Policy, which comprises strict standards and monitoring in areas of intense activity, partnerships to build awareness, and demonstration of environmentally-sound techniques, among other components, represents an approach to counter the negative environmental health impacts of ASM.

4.3 Community Health

The occupational and environmental consequences derived from mining practices can be readily linked with health outcomes observed in affected communities. However, socio-economic and political conditions in ASM communities also play critical roles in human health and wellbeing. Communities affected by ASM experience numerous vulnerabilities that increase risks to their health and wellbeing. Much like other marginalized, rural communities, poor health delivery services and infrastructure,

¹⁴ This training material can be accessed through Document Centre at the CASM website at www.casmsite.org.

circumstances that exacerbate transmission of communicable diseases and low socioeconomic status are key factors. Conversely, miners' incomes are often higher than regional averages, enabling the purchase of goods and services essential to the maintenance of good health. When spin-off economic benefits are considered, others in ASM communities can also experience the health benefits that commonly correlate with increased incomes.

Rural populations, children and people with the lowest socio-economic status typically experience the greatest threats to health security (UNDP, 1994). In comparison to their urban counterparts, people in rural communities typically have less access to services, such as health care and education, and a reduced dependence on the cash economy for food and non-food purchases; rural populations *generally* also have fewer health problems due to contamination (e.g. air, water pollution) from overcrowding (Ruel et al., 1999).

As a rural livelihood, ASM is rather exceptional in some respects. Due to poor services, increased prices of goods and services caused by the ASM driven cash economy and potentially increased exposure to pollutants, residents of hastily-established, remote ASM communities may experience the worst of both urban and rural environments. In addition, it typically takes several years or even decades for mining "boomtowns" to qualify as established communities and receive public services to accommodate community residents (Hentschel et al., 2001).

Communicable Diseases

Inadequate public services, poor hygiene and deficient housing conditions, combined with limited awareness and risky personal practices, all increase the potential for transmission of infectious diseases. Diseases frequently observed in ASM communities include malaria, tuberculosis, influenza, cholera, yellow fever, and sexually transmitted diseases, including HIV/AIDS.

Individually, each of these diseases is extremely detrimental to health and wellbeing. Jointly, these multiple health risks create a tremendous barrier to community health and development.

"Infectious diseases impede efforts to bring developing countries out of poverty. They keep children away from school and prevent adults from working or caring for their children. Serious illness is one of the major reasons why poor people remain poor. Poverty breeds infections; infections breed poverty (Neira, 2001)."

In Rwamagasa Village in Tanzania, malaria, tuberculosis, and HIV/AIDS are the dominant causes of morbidity and mortality (Wagner, 2003). This is consistent with global statistics that attribute almost 40% of deaths from infectious diseases to these three afflictions (WHO, 2003). In a survey of eight ASM villages in Lao PDR, between 37% and 67% of miners reported incidences of malaria, acute respiratory illness or diarrhoea within a twelve-month period (Boungaphalom, 2003).

This situation is exacerbated by the growing concern that the infectious agents that cause communicable diseases can also contribute to increased risk of cervix, liver, bladder and stomach cancer. In the developing world, viruses,

parasites and bacteria associated with infectious diseases are believed to account for 26% of cancers, compared with 8% in the industrialized world (WHO, 2003).

Of all infectious diseases, malaria presents one of the greatest causes for concern in developing countries. Annually more than 300 million acute cases of malaria are reported, resulting in the death of more than 3,000 people every day, mainly sub-Saharan African children (WHO, 2003). Frequently cited by miners and their communities as a primary health concern, the potential for malaria may be increased by flooding and generation of standing water, for instance in abandoned pits. In addition to the direct health impacts, malaria results in loss of workdays and can additionally consume up to 25% of household income (WHO, 2003).

One of the major community health risks from ASM relates to water contamination, not only from chemicals leached from mine waste or discharged with effluent, but also from domestic wastes, such as sewage, detergents and other chemicals (Hentschel et al., 2003). Often these same waters are also used for domestic purposes, including consumption. Inadequate infrastructure, in particular nonexistent water treatment and sanitation systems, coupled with limited access to health services and populations often densely quartered, lead to a host of diseases and ailments.



Photo 8: An ASM Village in Papua New Guinea
(Photo by J. Hinton)

Community health assessments conducted through the Global Mercury Project in ASM sites in Brazil, Indonesia, Lao PDR, Tanzania, Sudan and Zimbabwe documented widespread diarrhoea, typhoid and parasitism, and poverty-related ailments, such as malnutrition (Ibrahim, 2003, Darmutji, 2003, Mtetwa

and Shava, 2003, Purwana, 2003, Wagner, 2003, Shoko, 2003). The bush and forest were most commonly used as a toilet at GMP-sites, with the exception of Tanzania and Brazil, where a high percentage of the population use pit latrines. In the case of Galangan, Indonesia, more than 50% of miners use flooded pits for sewage disposal as well as drinking water (Purwana, 2003). Relying on water mainly extracted from wells or rivers and, to a lesser extent, boreholes, only a fraction of the population of GMP-sites in Tanzania, Brazil and Galangan, Indonesia, undertake chemical treatment or boiling of water prior to consumption (Hinton and Veiga, 2004).

Caused by exposure to a host of viruses, bacteria and parasites, diarrhoea results in 4% of all deaths worldwide (WHO, 2000). Every minute, seven children around the globe die from diarrhoea. Passed predominantly by water contaminated with human or animal faeces, the risk of generating a diarrhoea-inducing illness increases with poor hygiene (e.g. hand washing), lack of clean water, living in close quarters with animals and inadequate human waste disposal practices.

An acute intestinal infection that causes watery diarrhoea, vomiting and rapid dehydration, cholera is transmitted primarily through ingestion of contaminated food and water (WHO, 2003). Initially spread through faeces of an infected person, cholera bacteria can survive for extensive periods in water. Although use of oral rehydration salts can generally lead to recovery, if left untreated, cholera can cause death within a few hours. In 1998, a cholera outbreak in the ASM community of Mogrenore, Burkina Faso spread to nearby Ougadougou, prompted health officials to examine sanitary conditions in neighbouring ASM communities (Jacques et al., 2002).

Due to the high rates of poverty, the status of women in many societies and limited alternative survival strategies, the sex trade is prevalent in many ASM communities. Given this, combined with the transient nature of this activity and often pervasive high risk behaviour, it is not surprising that many ASM regions are plagued by high incidences of HIV/AIDS and other sexually transmitted diseases. For example, more than 70% of women interviewed in a major mining area of Kenya reported at least one incidence of venereal or other sexually transmitted disease (Amutabi and Lutta-Mukhebi, 2001). In many of the countries with the highest rates of HIV/AIDS, ASM represents an important component of the economy. For instance, ASM employs 350,000 people in Zimbabwe (Henschel et al., 2001), where the adult HIV/AIDS rate is 33.7% (UNAIDS, 2001). In Mozambique, where 80-100% of the gold production is attributed to ASM, the HIV/AIDS rate is 13% (UNAIDS, 2001). Although difficult to ascertain due to the migratory nature of ASM, this mobility combined with relatively high incomes has resulted in a prevalence of HIV/AIDS in miners in Zambia and Botswana estimated at 18% and 30%, respectively (compared to national rates of 16% and 35%, respectively) (Smart, 2003).

In response to an evident need for increased attention to this issue, CASM sponsored a special workshop on the topic at the 2003 AGM in Ghana. Rosemary Smart, an HIV/AIDS consultant working mainly in South Africa, provided considerable insight into the causes and consequences of the epidemic and explored what responses may be appropriate to ASM.

Almost 90% of cases are attributed to people between the ages of 15 and 45, and, as the most productive proportion of society, this has had devastating consequences at the family, community and national level (Smart, 2003). In addition, this is the age when most people are active parents. The untimely illness and death of a primary care giver causes a vicious cycle. Children are less likely to attend school and often do not receive the guidance and resources they require to develop into healthy, productive adults. Thus, the epidemic has created a major threat to economies and their development at both a macro and micro level. Macroeconomic effects of HIV/AIDS include decreased productivity and increased costs in both the private and public sector through absenteeism and loss of workers (Smart, 2003). Allocation of government funds to HIV/AIDS related spending further impacts those resources available for other programmes. At the microeconomic level, effects include changes in expenditure patterns, such as reduced savings and investment in human capital due to loss of household income (Smart, 2003). As a consequence of HIV/AIDS, it is estimated that poverty has increased by 5% in sub-saharan Africa (Smart, 2003).

As remote and often marginalized ASM communities general have limited access to adequate health services, included potentially life extending treatment, and they face high risks of contracting other communicable diseases and illnesses, they may be particularly vulnerable to premature mortality from HIV/AIDS. As such a large proportion of ASM takes place outside of a legal framework, it has been difficult to implement programmes to monitor or control the spread of HIV/AIDS (Dreschler, 2001). It is evident however, that study of the role of this sector in the spread of this disease and development of appropriate interventions is critically needed.

An excellent model of the interventions needed to counter the HIV/AIDS epidemic has been practiced by the African Medical and Research Foundation (AMREF), one of the oldest NGOs in eastern Africa. Working in Tanzania, once AMREF became aware of the high prevalence of HIV/AIDS and other STDs in ASM communities, it mobilized a comprehensive Mine Health Programme in specific high-risk mining communities. Components of the programme include encouraging healthy behaviour in the mine workforce, facilitating community involvement in prevention, targeting female food and recreational facility workers, supporting access to and use of vaccination services, improving district health systems, implementing interventions and dissemination lessons learned (Mohammed and Bukenya, 2005). HIV/AIDS as well as other STDs, malaria and tuberculosis are included in the programme.

Challenges faced by AMREF include low acceptance of male and female condoms, difficulty overcoming high-risk practices, the stigma of HIV/AIDS causing a lack of desire to get tested, fatalistic outlooks, inadequate health referral systems and lack of time of miners to participate in the programme. Future efforts seek to address these issues, in part by addressing individual and collective behaviours. Due to limited sponsorship, the Mine Health Programme is currently limited to formal mining companies. However, AMREF seeks to encompass ASM within future efforts and provide the support direly needed to turn the tide of the epidemic.

Socio-economic Status

Socioeconomic position or status (SES) is one of the most significant determinants of health (NALD, 2001). SES is based on resource-based factors, such as income, wealth, occupation and educational levels, and prestige-based factors, such as influence, power, rank in a social hierarchy and means for participation (Krieger, 2002, Mueller and Parcel, 1981). Across nations and cultures, it is widely recognized that health status generally decreases with socio-economic status, i.e. the rich and powerful live healthier, longer lives than the poor and disempowered. "While death is ultimately quite diplomatic, deferral appears to be a privilege correlated with rank" (Evans, 1994, p. 9).

The links between SES and health outcomes are well-established (Kennelly et al., 2002). However, whether economic status causes poor health or poor health causes low economic status has been the source of some debate (Adda et al., 2003). This quandary is clearly illustrated in the ASM sector. As Nobel Laureate, Amartya Sen states "the deprivation of health is bad even for the economy because people's productivity depends on their level of nutrition and health. The functioning of the economy suffers from illness-related absenteeism" (Mach, 2004). Other factors perpetuate the cycle. Low education levels reduce opportunities to acquire employment and move up in socioeconomic status, yet low incomes, poor health and high financial and psychosocial strains on families tends to keep children from attending school (Buchmann and Hannum, 2001).

Although there are multiple components of SES, income levels are commonly used to bridge the gap between SES and health. Despite their hard work and often higher than average incomes, most miners continue to live in poverty. The increased price of local goods, combined with degradation of agricultural lands, can decrease the capacity of ASM community residents to purchase sufficient food. Malnutrition is, therefore, a major concern. Health care costs can also be high. In Chakari, Zimbabwe, residents must travel 20 to 40 km for health care at a cost on the order of Z \$2,000 (US\$2.43) – almost twice a miner's daily income - for the return trip alone (Shoko, 2003). In Crepurizinho, Brazil, where almost 40% of miners had reported illness within a two month period, treatment costs average R\$160 (US\$53), which is equivalent to almost one months wages (Mathis, 2003).

Social Disruption

At the 2003 Conference on Women in Mining: Voices for Change in Papua New Guinea, a recurring theme related to the social disruption from mining including domestic violence caused by widespread alcoholism and increased sex trade activities. The factors that can upset social conditions relate to the influx of miners with other cultural backgrounds and changes in the cash economy, particularly in association with the increase in the cost of food and other services.

In addition, threats to the personal security of residents of ASM communities have been documented throughout the world. In the Madre de Dios gold mining region of Peru, high crime rates and incidences of violence, including rape, are, in part, attributed to the absence of police and lawlessness common in many artisanal mining communities (Kuramoto, 2001). Increases in acts of violence by Amerindian men in Guyana have been attributed to the influence

of miners and the “mining culture” (Anon, 2001). With the increases in the sex trade, gambling and drug and alcohol abuse that frequently accompany the influx of miners, combined with the notable absence of authorities, the potential for crime and violence presents a serious health concern.

Stress and Psychological Wellbeing

Despite the evidence that indicates the strong link between mental and physical health (WHO, 2001), indicators of mental health or stress have not been studied in the context of ASM. Factors contributing to stress may include:

- Poverty;
- Lack of livelihood options;
- Stigma associated with HIV/AIDS and other illnesses;
- Social isolation due to physical, social or psychological barriers; and
- Prolonged vulnerability to outside threats, e.g. violence, droughts or other external shocks.

The effects of migration may also weigh heavily on psychological well-being and physical health. In Mashonaland, Zimbabwe, factors such as change in diet and stress associated with leaving traditional lands (and breaking social ties in the process) was linked to negative health impacts on women who migrated to a mining region (Hunter et al., 2000).

The health impacts associated with ASM are strongly linked with the poverty cycle. Poor health generates a vicious cycle – when spouses or family members are infirmed or incapacitated and their ability to work is diminished, a “healthy” family member must work harder to pay for normal living expenses in addition to health costs. Whether caused by occupational, environmental or community factors, ill health of a family member may initially drive people into ASM and - as arduous work coupled with inexperience in mining and lack of knowledge about chemical exposures can further exacerbate the potential for injury or illness - the cycle of ill health and poverty is perpetuated.

It is clear that efforts to advance of the ASM sector must explicitly promote good health status in ASM communities. Recognizing the interconnection between human health and the technical, environmental, socio-economic and legal aspects of ASM, with guidance from international initiatives such as the Millennium Development Goals (MDGs), can serve to fortify the actions aimed to achieve sustainable community health.

5 SOCIO-ECONOMIC IMPACTS

Socio-economic impacts of ASM vary somewhat from country-to-country, culture-to-culture and community-to-community but many similarities can be found. These are based, in part, on the commodity being mined and the factors that have driven people to participate in mining. With the exception of many industrial minerals extracted to satisfy construction demands in nearby urban centers, artisanal or small-scale mines are predominantly located in remote, rural areas that are deprived of government and foreign assistance resulting in deficient infrastructure and poor services. Thus, the challenges, opportunities and risks facing rural communities are often shared or exacerbated by ASM.

Much of the discourse on the socio-economic impacts of ASM has traditionally focused on its economic contribution to rural communities. ASM provides an important source of revenue to local economies; and increases local purchasing power and demands for locally produced goods (e.g. tools, food, housing, infrastructure) (Hentschel et al., 2001). Although Labonne (2002) asserts that ASM is unlikely to contribute to long-term poverty reduction, particularly if it is kept outside the realm of integrated rural development strategies, it nevertheless provides a source of much-needed, albeit mostly informal employment in regions where viable alternatives are lacking.

In order to appreciate the nature and extent of the socio-economic impacts of ASM, it is necessary to understand not only its microeconomic effects, but its socio-cultural effects on ASM communities, including indigenous peoples, and the social context in which it takes place. An overarching driver of these impacts is the macroeconomic context that enables, hinders or perpetuates ASM as a rural livelihood.

5.1 Social Context

Communities and individuals are distinct both in terms of their vulnerability and resilience in the face of social change. The capacity to adapt to or recover from changes, shocks or major disruptions generally relies, in part, on the magnitude and duration of social impacts, factors which are as variable as ASM itself. As they are driven by different social factors and lead to different social outcomes, the four main types of ASM, as described by Baffour (2003), provide a means to understand the nature of ASM's effects on social conditions.

Seasonal ASM

Providing an added source of employment on a periodic basis, seasonal ASM is alternated with other economic activities (typically agriculture) in order to generate capital from both livelihoods. Frequently, seasonal ASM takes place on traditional lands and within family units, providing a much needed supplement to agricultural incomes. Often small in scale, mining usually generates comparatively minor environmental and social effects. Consequently, seasonal mining is more often associated with stable communities and generally yields positive social contributions (Weber-Fahr, 2001).

In some cases, seasonal ASM leads to migration of miners from traditional lands, potentially causing social disruptions. In the Ingessana Hills District of Sudan, male farmers leave the mining areas around Gugub village during the planting season, increasing the female mining workforce from 50% to 90% in these villages (Ibrahim, 2003). As a consequence, many women forego attention to their small plots and become temporary household heads during this period.

Shock-push ASM

Catalyzed by major disruptions, such as droughts or conflict, shock-push ASM involves the poverty-driven influx of frequently unskilled farmers into the ASM sector, either in their homelands or regions where mining opportunities are perceived to be present. The trauma associated with leaving homelands and/or traditional livelihoods, particularly under extreme circumstances, is often worsened by fears for personal, health, economic, food and community security. When a large number of miners are involved, competition for resources can be high, leading to low incomes. National or regional authorities that lack the capacity or mandate to intervene can aggravate the stress experienced in the event of “shocks”, which can exacerbate the erosion of social support networks and feelings of social isolation experienced by many families (Millar, 1994).

The Mongolian ASM sector was borne of extreme economic shocks. In Mongolia, the end of the Soviet system sparked the collapse of the economy and with it, the capital needed to sustain the agricultural sector through fertilizer, fuel and seeds (Erdene Baatar, 2004). Driven from the cities and crop farms to their previous nomadic livelihoods, Mongolian livelihoods were once again devastated, this time by disease that decimated their livestock. With few viable options, more than 100,000 people became placer miners and now comprise the bulk of the ASM sector in Mongolia (Erdene Baatar, 2004).

Rush ASM

In the case of high unit value commodities, such as gold, diamonds or niobium-tantalum (coltan), once discovered, in-migration can be extremely rapid, with mine camps emerging in the course of a few days and, in some cases, population increasing ten-fold in a matter of months. Although these camps sometimes evolve into permanent settlements, due to the “temporary” and ad hoc nature of these villages, overextended public health services and government officials cannot cope and rarely allocate the resources needed to assist these communities (Hentschel et al., 2001).

When mining is prompted by a “rush”, a familiar cycle usually occurs: discovery, in-migration, and economic booms are followed by resource depletion, out-migration and economic destitution (Veiga and Hinton, 2002). The ad hoc communities that form around these activities are characterized by drug and alcohol abuse, prostitution, disease, gambling, and violence (Hentschel et al., 2001). In some cases, 50,000 to 100,000 of miners and their families can migrate to a mining area over the course of months (Weber-Fahr et al., 2001), bringing with them a host of different values, practices, opportunities and risks.

Indigenous communities may be ill-equipped to address the rapid alteration to socio-cultural, environmental and economic conditions that have fallen on their doorstep and a previously tranquil society can be rapidly thrust into chaos. The promise of real or imagined riches often lures local residents from their traditional ways of life (Hentschel et al., 2001). The pressure felt by local people to make the transition into mining is further exacerbated by the escalation of food and service costs, which frequently occurs as ASM stimulates the cash economy.

Due to the speed at which the changes take place, miners tend to be highly disorganized. The exception may be a few entrepreneurs (or in some cases militant or guerrilla forces) with the skill and foresight to take advantage of this chaotic situation. Exploitation of less skilled seekers-of-wealth often ensues. In the Amazon, MacMillan (1995) described “owners” of ASM rush sites who allocate plots, collect taxes and charge fees for transportation and goods and services, including food and accommodation. In isolated locations, these prices are high and easily consume and even exceed the miners’ pay, with debts entrapping them into servitude. In the diamond mining areas of the Central African Republic, a similar situation exists where mine “managers” make, on average US \$280 per month compared to US \$50 per month given to diggers and washers. Women and other labourers are irregularly paid allowances for their work.



Photo 9: Post-rush Mining Activities, Brazil
(Photo by M. Veiga)

Permanent ASM

In regions with long-established mining histories, stable communities are more likely to develop and, as a result, ASM may contribute to social improvements (Weber-Fahr, 2001). In some cases, as a rush dissipates, a substantial number of miners settle in regions with established (yet not rush-worthy) mineral resources. In other cases, seasonal miners forego agriculture to undertake

mining permanently or miners retrenched from large-scale, formal operations switch to mining independently.

Many mining regions throughout the world have relied on ASM for centuries and even millennia. In some cases, mining is a culturally significant tradition and its sustainability could be viewed as critical to maintaining community security. In Keana, Nigeria, where salt has been mined by indigenous women for the last 700 years, salt is viewed as a gift from the gods (Onuh, 2002). Mining culture also runs deep in the Indian state of Rajasthan, where marble was mined for construction of the Taj Mahal (Chakravorty, 2001). In Mozambique, Mondlane and Shokko (1993) documented combined power structures in established ASM communities. Key authority figures include local/state government officials, traditional and indigenous leaders, and mine camp leaders. Miners often continue to honour their religious beliefs by proffering gifts of gold to traditional chiefs and participating in ancestral worship.

Whether founded in recent or ancient history, a distinct, although often informal, organization emerges at most permanent ASM sites. In Sri Lanka, where precious and semi-precious gemstones have been produced for over two millennia, most sites include a landowner, providers of wood for timbering, water pumps and fuel, a site boss and at least eight, low-paid miners (Katupotta, 2004). Usually, site bosses have highly developed skills, acquired from decades of mining experience, and are well-equipped to take full advantage of the relatively unskilled labourers. With a well-established black market gemstone trade, the largest pipeline linking with Thailand, a class of savvy entrepreneurs has emerged in Sri Lanka. By buying from miners and selling at a substantial profit to Thai traders, many of these buyers have amassed considerable wealth and power sufficient to protect their interests (Katupotta, 2004). As a consequence, miners are likely to remain poor and disenfranchised, a condition sustained by the social context in which they live.

Certain socio-cultural norms can also perpetuate harmful practices thereby weakening community security (UNDP, 1994). For instance, in established mining communities in Niger, children who are descendents of former slaves are involuntarily relegated to lives as miners (Jennings, 1999). Traditional gender roles also can limit the ability of women to fully benefit from ASM. In Zambia, women are prevented from gemstone mining in the belief that they would cause the spirit of the stones to drive the gems deeper into the earth (Synergy Africa, 2001), and in Suriname, Ndjuka Maroon women, who are exiled during menstruation, have reportedly taken oral contraceptives to prevent menstruation in order to continue mining (Heemskerk, 2000).

5.2 Infrastructure and Public Services

The provision of public services and infrastructure, including schools, hospitals and roads, generally depend on geography, topography, national poverty levels, the district resources for social services, the remoteness of the community and whether it is a recent (i.e. "temporary") or well-established settlement. The marginalization of ASM by many governments is often a major factor in the presence and quality of public services.

In some cases, districts, states or provinces with greater natural resource endowments, including agriculture and mining, have comparatively higher per capita incomes than other regions and receive considerably better public services than their poverty stricken counterparts. In Tanzania, for instance, Musungwi District has considerably higher poverty levels than Geita District, respectively ranking 7th and 2nd in terms of contribution to regional GDP (Mwaipopo, 2004). Musungwi has a far less active ASM sector than Geita and experiences low rainfalls with corresponding poor performance of the agricultural sector. Despite an extensive road network, less than 5% of the population of Musungwi has electricity, health facilities are dilapidated and inequitably distributed and water supply infrastructure is poor (Mwaipopo, 2004). In contrast, Geita, which has a number of large, formal mines and is believed to have the largest number of artisanal and small-scale miners in Tanzania, is far better endowed in terms of social services.

Although royalties, community development funds or government obligations to provide decent services to rural communities should lead to acceptable infrastructure and public services, most ASM communities continue to endure inadequate health services, poor hygiene and deficient housing conditions. Basic sanitation is frequently not provided by governments and, in many cases, pit latrines and piped water are a luxury. Many ASM communities, particularly recently established ones, rely on the bush, forests, rivers or abandoned pits as toilet facilities and local creeks, rivers and shallow wells for potable water. These factors combined with poor personal hygiene practices all increase the potential for transmission of infectious diseases.

Countries, including Ghana¹⁵, have instituted mining royalty returns back to local mining communities for development and environmental remediation purposes (Coakley, 2003). The flowback of these royalties to communities, has, in many cases, reportedly been marginal. In late 2001, local youths reportedly attacked local chiefs and looted their palaces in Wassa Wassa, Ghana, in response to discontent over lack of community improvements (World Bank, 2003). In any case, as ASM is predominantly illegal, royalties are generally not paid. In situations where town or county authorities institute a direct tax on mining activities – for instance, a per truckload levy charged for industrial minerals – whether these funds actually contribute to any local improvements is uncertain.

In many countries, whether ASM communities have the “right” to public services depends on whether it is formally “registered” as a community. Communities perceived as being temporary are unlikely to achieve this status. There are a number of examples of well-established ASM centers receiving services far better than recent settlements. In Nyarugusu village in Tanzania, more than 80% of households have non-concrete pit latrines (Mwaipopo et al., 2004), while in Crepurizinho, Brazil 97% of residents have pit latrines (Mathis, 2003). In both cases, the bulk of these populations have corrugated iron sheet

¹⁵ In Ghana, at least 3% of the values of minerals produced are paid in royalties. This amount is further subdivided between the central government (80%), Mines and Geological Surveys Dept and Minerals Commission (10%) and the Chieftancy (10%). The chieftancy is supposed to retain 10% of this remaining amount and distribute 90% to local mining communities (Coakley, 2003).

roofs with walls of cement or baked earthen bricks. Schools, medical facilities and other social service facilities have been provided by government authorities. ASM has been active in these locations for decades. Although the onus for construction of pit latrines and decent housing is often on the shoulders of community residents, the relative permanence of mining in these areas, combined with the capital to do so, likely creates the initiative needed to make these improvements. Plagued by fears of eviction, “temporary” illegal communities are less likely to invest the energy and money into construction of permanent structures and improved services.

The generally poor conditions, particularly in recent ASM communities, can, in part, be attributed to the lack of consideration afforded to ASM in the community health and development agendas of government institutions. Excluded from most national and local poverty reduction strategies and scarcely acknowledged by the majority of related government agencies (e.g. Ministries of Health, Finance, Public Works or Social Development), there is little impetus to give priority to the infrastructure and public service needs of ASM communities. Advocating for better services and explicit inclusion of ASM within these agendas, either by miners themselves, mining authorities under whose mandate ASM falls or the international community, would ignite the process of achieving positive changes on this issue.

5.3 Microeconomics

It has been suggested that ASM can be an essential source of income and employment and has the capacity to stimulate the economic development believed to be critical for human development (Weber-Fahr et al., 2001). Even in the case of illegally smuggled mineral commodities, most ASM revenues are invested locally or regionally (Jacques et al., 2002). Revenues derived from ASM can markedly increase local purchasing power, providing a means to stimulate production of local goods and services, including both those specifically required for mining (tools, equipment, infrastructure) and day-to-day living (e.g. housing, food) (Hentschel et al., 2001).

In Alga, Burkina Faso, Jacques et al (2002) explored the regional contribution of ASM to the economy. In April 2002, the daily production of 420 grams of gold from 17 tonnes of ore yielded average daily incomes of US\$ 3.23 for 1,750 male and US\$ 1.71 for 700 female miners and labourers, equating to more than US\$ 5,300 per day. Assuming all revenues are spent within a 40 km radius of the site, an estimated US\$ 20 is contributed to each person in the region annually (given an equitable distribution), and, assuming similar returns over more than a decade of mining, more than US\$ 25 million has been injected into the regional economy.

The distribution of ASM revenues, and how these revenues are subsequently spent, is a key determinant of the contribution of ASM to local development. In Burkina Faso, about 64% of gold revenues are distributed to “pit side” producers, who spend much of this on local goods and service providers. In Nagrigré, Burkina Faso, a gold rush saw the influx of 2,000 artisans, followed swiftly by 500 shopkeepers who responded to the miners’ demands for beer, “escorts” and various electronics, among other things (Jacques et al., 2002).

Local villages, however, can benefit more directly from mining, for instance, through provision of water. Although water consumption has increased tensions with local farmers, in Alga, this contributes more than US\$ 530 per day to village authorities.

More formalized revenue distribution schemes have emerged in some countries, but this does not necessarily mean high returns for miners. In Sri Lanka, about 3% of revenues are given to charity, 20% goes to the landowner, 10% goes to the water pump owner, and the remaining 67% is distributed amongst the miners and mine owner (Dharmaratne, 2004). On average, this equates to each miner receiving 2.5-3.5% of gem sales. In the Cerro Rico cooperatives in Bolivia, on average, cooperative members receive as much as US\$ 60 per month but, when mineral prices are low, they earn as little US\$ 25 monthly, well below the national minimum wage of about US\$ 50 per month (Bocangel, 2001).

Miners, nevertheless, often earn more than national averages (Table 5). Considering that rural incomes are typically much lower than their urban counterparts, miners often make far more than their non-mining neighbours. For example, a USAID-sponsored study in Tanzania found that miners earned on average six times more than the average wage from farm labour (Phillips et al., 2001). How much capital trickles down to those working in non-mining livelihoods (e.g. agriculture) is uncertain.

Table 5: Artisanal and Small Scale Miners Incomes in Selected Gold Mining Regions

Region or Community	Community Data	National Data ¹	Ratio Miner:National Income
	Annual (US\$)	Annual (US\$)	
Bolivia ² - Cerro Rico	720	900	0.8
Burkina Faso ³ - Alga	1,000 (men) 530 (women)		
Brazil ⁴ - São Chico	1,500	2,850	0.5
- Crepurizinho	2,148		0.8
Indonesia ⁴ - Talawaan	492	710	0.7
- Galangan	1,056		1.5
Lao PDR Villages ⁴	456	320	1.4
Papua New Guinea ⁵	900	250	3.6
Sudan ⁴ - Ingessana	< 960	340	2.8
Tanzania ⁴ - Rwamagasa	532	280	1.9
Zimbabwe ⁴ - Kadoma-Chakari Region	588	480 ²	1.23

1. Based on gross national incomes (per capita) in World Development Indicators 2002 (<http://econ.worldbank.org/wdr>)

2. After Bocangel, 2001.

3. After Jacques et al., 2001.

4. Information obtained from the Global Mercury Project (2004)

5. After Neale, 2003.

The spending patterns of miners strongly influence the nature and extent of community-level economic benefits. In many cases, revenue derived from mining is not directed towards improving family or community wellbeing, but

is used to satisfy personal interests. Kato (2005) reported that the little money earned by miners is spent mainly on gambling, alcoholism and prostitution - only when this is depleted do miners return to work. Women miners have been shown to allocate most revenues to meeting family needs (i.e. education, health). Most miners lack the "culture or financial capacity" to build up their savings, a situation which, in the case of itinerant miners, is much to the detriment of the family that stays behind in the village (Jacques et al., 2002).

Despite the potential magnitude of ASM revenues, there is often considerable disparity in ASM communities. Due to its economic contribution, food security (i.e. people's ongoing physical and economic access to basic food) can increase in ASM communities, particularly for miners and their families. However, many residents of ASM communities, particularly non-miners, may have decreased food security due to escalating food prices and decreased local production due to influx of the local agricultural workforce into mining.

In Mgusu, Tanzania, a detailed socio-economic assessment revealed that one's occupation in ASM communities correlates strongly with their poverty levels, as denoted by insufficient income and expenditures to meet food security needs (Mwaipopo et al., 2004). Specifically, miners or mine service providers were less likely than non-miners, particularly those living outside the village, to live in extreme poverty. Miners' incomes obviously vary from community to community. Were the same miners to move to a neighbouring mining community (that was also investigated through the assessment), their poverty levels would be expected to increase from 24% to 40% of mining households (Mwaipopo et al., 2004).

In addition to food, other goods and services often tend to escalate in price with ASM activities. This can markedly reduce the saving and investment capacity of community residents. Unfortunately, very little work has been done on this issue. The microeconomic contribution of ASM will vary depending on factors such as the commodity being mined, the "permanence" of the mining settlement, the magnitude of ASM revenues and expenditure patterns within communities. It is clear than comprehensively understanding the microeconomics of ASM and affected communities depends on the capacity to collect reliable household and community level data.

At the 2003 CASM AGM, an intensive workshop was held to share information and experiences on the microeconomic context of ASM. Facilitated by Marieke Heemskerk, the workshop identified a number of barriers to the collection of reliable economic data. These include: the informality and illegality of the sector; the uncertain, intermittent and variable nature of incomes; the migratory nature of miners; inadequate funding for baseline studies; lack of trained, local researchers; and differing interests in communities. In addition, community members may be hesitant to provide accurate information due to the illegal nature of activities, tax avoidance, lack of trust towards researchers, the seemingly irrelevant nature of questions, lack of knowledge concerning the answer, and "research fatigue" (Heemskerk, 2003).

In any case, even reliable data collected at a particular time and location can be subject to rapid change. There are many types of miners and, within a given community, miners may be seasonal, permanent, migrant or local. As well, the

dynamic nature of the microeconomic ASM context is further influenced by the diverse and dynamic makeup of communities and their cultural beliefs and practices (Heemskerk, 2003). Finally, poverty and wealth is a socially and culturally-determined construct, thereby complicating cross-cultural and cross-community comparisons. Many of these issues extend to the wider community, where a variety of economic activities often take place, and these must also be understood in order to develop policies and programmes that facilitate development on a community level.

Thus, efforts to characterize the microeconomics of ASM communities face many challenges. The CASM workshop identified a number of strategies that can help facilitate data collection. These include endorsement of data collection by community leaders and authorities, establishment of a relationship between target communities and researchers prior to data collection, ensuring that local participants understand and recognize the significance of the data collection and gathering of qualitative data as a supplement to or in lieu of quantitative data in some cases (Heemskerk, 2003). The nature of the data required for a microeconomic assessment should necessarily extend beyond local income and expenditure data. Much like a household survey, information on issues such as education levels, health expenses, nutrition and dietary practices are needed to comprehensively understand the effects of ASM on poverty. The Baseline Profiling Guidelines for ASM (described in Chapter 10) provide some guidance in this regard.

5.4 Macroeconomic Mineral Policies

Mining sector policies are critical in terms of creating an enabling environment for the ASM sector. The multiple macroeconomic variables impacting the ASM economy relate to goods and services produced, total income earned, employment levels, market access and commodity prices. ASM-focused mineral policies generally seek to encourage economic growth, price stability, full employment and the attainment of a sustainable balance of payments. Enabling mineral policies include those which (*after* Hentschel et al., 2001, UNECA, 2002):

- Facilitate receipt of reasonable royalties and taxes;
- Fairly distribute the benefits of mining;
- Mitigate or prevent conflicts associated with multiple land use;
- Support a liberalized economy through access to open, transparent markets;
- Curb or eliminate smuggling or black market trade of minerals through vigilant monitoring, stiff penalties and provision of extension services (e.g. district buying centres);
- Improve the flow of information, particularly that which builds awareness of available opportunities;
- Streamline licensing and monitoring procedures for mineral dealers and buyers; and
- Promote value added opportunities.

There are a growing number of efforts seeking to transform related mineral policies into practice.

Minerals marketing schemes with well-structured monitoring and reporting mechanisms have been instituted by the Tanzanian Mineral Resources Division of the Ministry of Energy and Mineral Development. Networked to 11 regional and 12 district satellite offices, the Division is empowered to undertake impromptu inspections of licensed mineral dealers' records and prevent foreign dealers from buying directly from ASM sites (UNECA, 2002). With monitoring undertaken by the Tanzania Revenue Authority, the Government further organizes and monitors open gemstone auctions, a practice which supports a free-market gemstone trade and enables direct collection of related royalties and taxes.

Export regimes which inhibit smuggling and illegal trade, for instance through increased vigilance of border authorities and stringent reporting requirements of mineral dealers, are measures with the capacity to hinder the perpetuation of black market mineral pipelines. A recent study of cross-border gold trade suggests that most of the gold exported from Uganda originates in the northeastern Democratic Republic of Congo (DRC) (HRW, 2005). In 2002, official domestic gold production was valued at US \$24,817 while exports were listed at just under US \$60 million (HRW, 2005). While much of this is comprised of illegally mined Ugandan gold, due to the limited number of gold producers in the country (<15,000), it is likely that a significant proportion of this gold was smuggled from the DRC. Although mineral traffickers are required to declare mineral goods at a point of entry to the country, fears concerning the potential for robbery coupled with a lack of incentive to pay related taxes, precludes reporting at the borders. Since December 2004, Ugandan mineral dealers have been required to provide proof of origin prior to export. As an incentive, export taxes on imported (e.g. Congolese) gold are only 1% compared to 3% for Ugandan gold. The steadfastness of the Customs and Revenue Authority, the agency charged with monitoring mineral imports and exports, will determine whether this policy actually leads to reductions in illegal trafficking.

In addition to government agencies charged with the enforcement of ASM, export marketing boards and investment authorities have a clear role to play in the development of fair markets and promotion of value-added techniques. For instance, the Sri Lanka Export Development Board (EDB) has proposed a comprehensive mine-to-market strategy which seeks to add value in-country and increase the macro- and microeconomic benefits derived from gemstone mining (Malwatte, 2004). Promotion of jewellery exports through fiscal incentives, development of specialized financing mechanisms, in part through collaboration with domestic banks, and incorporation of international quality certification through a certified gem-testing laboratory are all measures proposed through the export strategy (Malwatte, 2004).

The Precious Minerals and Marketing Corporation (PMMC) of Ghana is one initiative that seeks to address market issues while concurrently promoting formalization. Established in 1989 with the passing of Law 218, the PMMC expanded the role of the Diamond Marketing Corporation (originally the Diamond Marketing Board established in 1963) to include the small-scale gold mining sector (Asante, 2003). Among other objectives, the PMMC seeks to enhance the creditworthiness of the mining industry, minimize smuggling by

providing a regular market with competitive prices for small-scale miners, and increase the revenue generated for the PPMC by small-scale miners.

PPMC has succeeded in bringing markets to producers by establishing gold buying offices in Accra and Tarkwa and agencies in six major centers, and by licensing 500 local gold buyers who sell directly to PPMC (Asante, 2003). Purchase prices are around 2% below the London Metal Exchange daily quote, although occasionally the full international market value is paid in order to out-price smugglers who are active in some regions. In the case of diamonds, miners have the option to sell to other registered buyers from countries including Belgium, Israel, India and South Africa. The buyers are located in centralized offices, provided by PPMC, which enables miners to negotiate the best price. Although the majority of raw products are exported (e.g. 80% of diamonds are polished in India), PPMC is allocating a portion of gold produced for local jewellery production in an effort to add value locally. Artisanal and small-scale gold and diamond mining in Ghana reportedly produces more than 250,000 ounces/year (>\$75M) and 1,000,000 carats/year (\$20M), respectively. Over 600,000 ounces of gold valued \$200M and 7.3M carats of diamonds valued \$170M have been purchased by PPMC from ASM since its formation in 1989 (Asante, 2003).

Despite these successes, few governments have sought to synchronize ASM-specific measures with broader macroeconomic policies. In many countries, there is a serious disconnect between macroeconomic and sectoral policies. For instance, macroeconomic policy can impede the formalization and legalization of ASM while mineral policy concurrently encourages these changes. It is, therefore, critical that efforts be undertaken to bridge the gap. Collaboration between mining ministries and those charged with development of macroeconomic policy is needed to ensure ASM and other rural economic activities are afforded appropriate consideration. A few comprehensive mining sector development projects have achieved some success in this respect, a result that seems to depend on the resolve by a number of actors to recognize ASM in macroeconomic policies intended to advance economic development and stabilize fiscal regimes. Key actors include mining, finance and economic development ministries, and investment and revenue authorities.

5.5 Livelihoods

The role of ASM in providing and inhibiting mining or non-mining livelihoods is a key determinant of the capacity of the sector to alleviate or exacerbate poverty. Traditionally, ASM has been on the periphery of development strategies, thus, its influence on livelihoods has been largely unrecognised. Direct livelihood opportunities provided by ASM include owners or operators, miners, processors, ore and water transporters, mineral buyers and equipment providers (e.g. water pumps, tools). Indirect livelihoods relate to other goods and services, such as providers of food, accommodation, transportation and the sex trade.

Participation in the ASM sector, either direct or indirect, depends on the availability and relative benefits of other livelihood alternatives. In an assessment of livelihood decision making in a gold mining region of Suriname,

Heemskerk (2002) used ethnographic decision-tree modeling to analyze and predict occupational choices made by Nduka maroons. Using a gender-sensitive model that identified the factors dictating livelihood choices of women and men, Heemskerk ascertained that decisions to participate in gold mining were 'rational', given the limited alternatives available to miners and the relative income generating capacity of ASM. Both male and female miners had considered available options prior to entering mining, had the means to enter the ASM workforce (e.g. time, transportation) and had some awareness of the health risks associated with mining.

Many governments are working to promote the development of ASM as a means to create livelihoods in impoverished, mineral-rich regions. In Papua New Guinea, subsistence farmers comprise about 70% of the population while the ASM sector only employs about 50,000 (Neale, 2003). On average, miners make K3600 (US\$900) annually, a considerable improvement from the annual average of K994 (US\$ 250). With the closure of many large-scale mines coupled with widespread poverty, the government and international aid agencies (AusAid, World Bank, Sysmin, Asian Development Bank, Japanese Social Development Fund) are endeavouring to improve the environmental, social and economic performance of the sector and viability of ASM as a livelihood alternative (Neale, 2003).



Photo 10: A Sri Lankan Woman Learns the Art of Jewellery Fabrication
(Photo by J. Hinton)

The positive or negative impacts of ASM on non-mining livelihoods depend, in part, on a community's vulnerability to change - the level of economic diversification and viability of these alternative livelihoods seems to be an important determinant of ASM impacts. In the Mwanza region of the Lake Victoria Goldfields in northern Tanzania, ASM activities complement an

abundant fishery as well as other agricultural activities (Mwaipopo, 2004). Approximately 85% of residents are engaged in farming of multiple crops for both commercial and subsistence purposes and the region retains about 13% of the nation's livestock. Agricultural diversification efforts have included a Participatory Irrigation Development Programme (PIDP) and crop rotation, which enables year round farming (Mwaipopo, 2004). Trading and small business provide additional livelihoods in the region with a 3.2% per annum economic growth rate. These factors have enabled residents to transfer livelihoods as needs, interests and resources permit (Mwaipopo, 2004). As people age, they have opted to abandon mining in favour of less physically demanding activities. Conversely, within the Mwanza region, Mgusu does not experience the same opportunities as surrounding communities. Situated within a forest reserve, restrictions on other activities (e.g. farming), has created a heavy reliance on ASM requiring people to mine through to old age (Mwaipopo, 2004).

Much of the discourse on livelihood development in ASM communities has focused on upstream opportunities, i.e. related to the supply of main inputs needed to maintain ASM activities, or downstream prospects, such as value-added processes (e.g. lapidary and gemstone cutting) (Box 1). The concept of "mining clusters", wherein growth is stimulated through the concentration of functionally-linked enterprises, has been promoted by UNECA (2002) as one means to advance livelihoods and economic development in mining areas. Regional facilitation of networks between related economic activities can generate the pool of skills and resources needed to sustain these activities. In the context of ASM, the "mining cluster" concept has not been explicitly advanced, but recent efforts have charted a similar course. Examples include:

- Local manufacture of ASM equipment;
- Production of ceramics or high quality bricks from artisanally mined clays;
- Dimension stone, lime and aggregate production for use in local construction;
- Jewellery manufacture from gemstones and precious metals;
- "Rocks for Crops", or extraction and processing of nutrient-rich minerals for agricultural amendments (e.g. phosphate, high neutralization capacity rocks); and
- Immobilization of mine tailings in cement for production of high-strength bricks for construction.

Although the opportunities for "micro-cluster" development in ASM seem possible in many situations, considerable support is needed. Specifically, training and equipment for downstream and upstream activities, provision of necessary infrastructure, improved relationships between authorities, miners and other sector stakeholders, and appropriate systems of taxation (UNECA, 2002). Explicit support for these "innovation nuclei" should become central to livelihood development in the ASM sector.

In many cases, intra- and cross-sectoral livelihood requires creative thinking. In Alta Floresta, Brazil, local miners have turned the depletion of gold resources,

which had a devastating economic effect on the region, into an opportunity. Small-scale miners have since converted flooded artisanal mining pits into fish farms. With 500 fish farms now in the region, farmed fish cost less than market prices for imported fish and, as the fish are artificially fed, mercury levels are low (Mutimeri and Veiga, 2003). These examples demonstrate that a little ingenuity and coordination of activities between sectors can result in some interesting opportunities to reduce poverty in ASM communities.

At a local, regional and national level, the contribution of ASM to development continues to be a contentious issue. Several studies have indicated that mineral wealth inversely correlates with GDP and absorbs capital while others suggest that mining makes a net contribution to state coffers, increases foreign exchange earnings and provides the raw materials necessary for the industrialization of economies (UNECA, 2002). Regardless of the debate, in the absence of viable livelihood alternatives, ASM will persist. By advancing upstream, downstream and lateral activities *as well as* supporting diversification of other sectors, ASM communities will both have increased livelihood options and a greater capacity to reduce poverty and facilitate development.

5.6 Indigenous Communities

The rights, cultural values and practices, social structures and traditional livelihoods of indigenous communities are often put at risk by incoming artisanal and small-scale miners, particularly in the case of rush or shock-push driven mining. The influx of miners, rapid stimulation of a cash economy, and often characteristic social changes (e.g. alcoholism, sex trade, violence) combined with degradation of traditional lands can create considerable distress and tension in indigenous communities. Changes to local values and social systems, for instance, increased acts of violence by Amerindian men in Guyana, have been attributed to the influence of miners and the "mining culture" (Anon, 2001).

ASM communities can be marked by conflict and insecurity. A number of examples of conflicts between nomadic miners and indigenous communities, mainly over natural resources such as land and water, have occurred throughout the world. For example, in 1993, miners invading traditional Yanomami lands in the Brazilian Amazon massacred more than 40 Yanomami men, women and children (Guzman, 1993); in the Madre de Dios Basin in Peru, where 9,500 of 15,000 families are dedicated to gold mining, conflicts with surrounding 43 indigenous communities are frequent (Kuramoto, 2001); and in Papua New Guinea, trespassing of artisanal miners onto tribal land is an ongoing source of violent conflict (Susapu and Crispin, 2001).

Although indigenous communities are often viewed in terms of the impacts from itinerant miners, in some cases, indigenous peoples also active participants in ASM. ASM may be intrinsic to the culture, taking place over centuries or millennia, as in the salt mines of Keana, Nigeria and Kibiro, Uganda, the marble mines of Rajasthan, India, and the Ashanti Goldfields of Ghana. In many mines, honouring of traditional beliefs by offering of gifts of

gold or other commodities to traditional leaders or religious symbols is integrated within daily ASM practices.

Box One: Downstream Livelihood Opportunities in the Gemstone Industry

At the 2004 CASM AGM in Sri Lanka, Rohitha Perera of Beehive Industries described the evolution of his gemstone business from one rented machine to a successful venture with over 600 employees. In addition, Perera now manufactures his own polishing machines, both for the domestic and international market. To start and grow a successful gemstone cutting business, Perera recommends the following (Perera, 2004):

- Gaining experience from a school or existing business
- Starting small, with one or two polishing machines. Clean air is needed, thus convenient locations outside of urban centres are ideal.
- Securing a supply of gemstones. Being situated near to a source of gemstones is useful, but not essential.
- Creating a well-trained workforce through a good training programme.
- Paying close attention to quality aids in accessing and maintaining a solid customer base.

Many countries have tremendous gemstone potential and corresponding opportunities to add-value but a highly underdeveloped gemstone sector. In 2001, almost 100% of the rubies and sapphires produced in Madagascar were exported in their raw state. A successful gemstone industry requires (Hager, 2004):

- Generating a local base of trainers and teachers to instruct miners, cutters, processors, traders, custom officials and gemologists;
- Build knowledge in processing and marketing, financing, identification and valuation, domestic and international prices, cutting and treatments, taxes and regulations;
- Develop and disseminate simple tools for identification, including hardness scales, balances and refractometers and valuation (4Cs: cut, carat, colour and clarity);
- Networking with and knowledge transfer from countries with developed gemstone industries. Equipment can also be purchased at much lower prices in these countries (For instance, Sri Lanka sells cutting machines at US\$ 650, compared to US\$ 2000 in industrialized countries);
- Reduction of import taxes for cutting machines and accessories, and tax credits for gemstone businesses;
- Increased taxes on export of raw stones; and
- Marketing events, such as gemstone auctions.

In countries with little capacity to add value to gemstones, a gemstone training school can make a tremendous contribution to development of the industry. In Madagascar, a school was established within one year and now is equipped with cutting machines and instructors who provide training to more than forty literate students (Cushman, 2004). The school is seeking to develop knowledge for small, independent operations, as they provide greater employment opportunities and can more easily access small markets in comparison to larger operations.

The Kankana-ey of the Philippines, for instance, have a more than 800 year tradition of mining (Caballero, 2004). Using the same methods as those documented by Spanish explorers in the seventeenth century, Kankana-ey work in cooperative family units, wherein women undertake mercury-free gold processing while men undertake digging. With firm belief that their god and spirits of their ancestors own the natural resources, community elders are empowered to make decisions concerning their management and resolve related conflicts (Caballero, 2004). With an attention to environmental

protection through recycling of all liquid and solid wastes, the Kankana-ey are concerned over pollution from recent large-scale mining projects in the region. Unease is further escalating over the influx of artisanal and small-scale miners encouraged through the Acupan Contract Mining Programme, whereby companies purchase products from ASM producers. Although changes have been marginal thus far, the Kankana-ey nevertheless fear threats to their way of life.

Whether indigenous peoples are engaged or tangentially impacted by ASM, they may have a different understanding of government laws or may have their own laws – this requires a degree of sensitivity in addressing the challenges of the sector (Hentschel et al., 2001). Alternative power structures inclusive of traditional and indigenous leaders should be recognized in order to support these communities in ASM development efforts. Community driven, participatory decision making processes are essential to ensure self-determination by indigenous groups and authentic steps towards achieving sustainable poverty reduction.

6 GENDER ISSUES

“Gender” refers to the behaviours, attitudes, values, beliefs, etc. that a particular socio-cultural group considers appropriate for males and females (Butler, 1990). Due to gender inequities, women generally derive far fewer benefits from ASM than their male counterparts. Conversely, they are more affected by negative impacts from ASM. Due to gender inequities, the implications of ASM related legislation, policies and programmes differentially affect women and men. Due to its inherent and pervasive gender inequities, the ASM sector is unlikely to become a catalyst for human development.

In many countries, women’s voices are virtually absent in political decision-making at national, regional and local levels. Consequently, women’s perspectives, needs, knowledge and proposed solutions being largely ignored and can result in policies that criminalize and further marginalize their activities (Sass, 2002). Gender barriers prevent women and men from accessing the full benefits of ASM, which in turn affects families, communities and nations. Key gender inequities relate to political power, access to resources (e.g. capital, land, information, education and training), and basic human rights. These factors, coupled with socio-cultural constraints, the absence of women in public office, and a lack of recognition of ASM as an activity contributing to poverty alleviation, are significant impediments. Gender inequalities are more pervasive than other forms of discrimination, cut across other forms of inequality, and are often more severe among poor (Lahiri Dutt, 2004).

Overcoming these inequities in ASM requires understanding of gender-based differences in labour market participation and the differential constraints and opportunities faced by women and men in relation to knowledge and skills, conditions of work, social protection, family responsibilities, and economic and political decision-making.

6.1 Gender Roles in ASM

Women’s and men’s direct participation in ASM varies throughout the world. In Asia, generally less than 10% of miners are women, whereas in Latin America, the proportion tends to be higher, approximately 20%. The percentage of female artisanal miners is the highest in Africa, ranging between 40 and 50%. These statistics vary regionally and from site-to-site. In some regions of Africa, the ASM workforce is comprised of 60 to 100% women, while in parts of Latin America and Asia, ratios can approach 50% and 70%, respectively (ILO, 1999; Amutabi and Lutta-Mukhebi, 2001; Beinhoff, 2002; Onuh, 2002; Lawrence, 2004).

The roles of women and men in ASM are often quite defined. A major review of gender issues in ASM discovered the following general trends (*after* Hinton et al., 2003):

- Women working in mines are most commonly involved in transporting ore and water, manual crushing and grinding, washing or work perceived to be ‘delicate’ such as panning, amalgamation and amalgam decomposition. When women undertake these activities, men are predominantly engaged in digging or primary rock breaking. Although women also function as

small mine owners and operators, this tends to be more of an exception than the rule;

- In extraction of high unit value products, such as gold, men more commonly maintain control of the mine site and often its revenues. Women are more likely to participate in greater numbers and play a more significant role in control of the land, and decisions surrounding its use for low unit value commodities, such as industrial minerals;
- Women’s direct participation in artisanal mining generally decreases with the increasing scale of ASM operations; thus, they are most prevalent in small family operations where mining takes place to supplement other income (e.g. from subsistence agriculture); and
- With increasing mechanization, the participation of women tends to decrease. This trend continues up the spectrum from “subsistence” mining, where women’s participation is high, up to the large-scale, formal mining sector, where women comprise only around 10% of the workforce.

Although mining is generally perceived to be the domain of men, the involvement of women in ASM in particular is generally high and is increasing (Lahiri Dutt, 2004). Women’s work in ASM is often informal and highly manual with little decision-making power, low status and income, less job security and more social and economic constraints than that of men (Lahiri Dutt, 2004). As women often work part-time at informal ASM operations, and occupy roles deemed “ancillary” (e.g. cooks, service providers), there may be significant discrepancies between the *estimated* and *actual* numbers of women involved in ASM (Wasserman, 1999). Further to this, as women are more frequently associated with transporting and processing materials, as opposed to digging, they are not always identified as “miners” (Susapu and Crispin, 2001).



Photo 11: Women Gold Miners in Sudan
(Photo by M. Veiga)

Cultural taboos can restrict the role of women in many ASM communities. For example, in many Latin America and African countries, taboos prevent women from working underground. In N'tulo, Mozambique, women are restricted from mining altogether as they are believed to attract bad spirits, and in Zambia, the presence of women is believed to cause the spirits of the gemstones to drive the stones deeper into the earth or disappear completely, a situation exacerbated during menses (Dreschler, 2001; Synergy Africa, 2001). Menstrual taboos in the Maroon culture in Suriname, prohibit women from engaging in activities, including sex, cooking for men, or touching items used by men as it will cause death, illness or other misfortune (Heemskerk, 2000). As a consequence, women are exiled to a menstrual hut for a portion of each month causing boredom, isolation, and reduced productivity. Some women working at mine sites take oral contraceptives to prevent menstruation (Heemskerk, 2000).

Both women and men experience the characteristic problems associated with ASM, such as occupational health risks, but women frequently face additional challenges which are not generally acknowledged. For example, one Tanzanian report on ASM affirmed that ASM is a physical demanding activity for women, but gave little attention to the fact that women need consent from husbands to apply for loans (Lahiri Dutt, 2004).

The direct roles of women in ASM often intersect with their roles as primary caregivers. At many ASM sites, women work with young babies tied to their backs and toddlers at their side (Hinton et al., 2003). In cases where alternative childcare or schooling is unavailable or additional supplementation of income is needed, older children accompany women in ASM activities, and often participate by hauling ore and water, breaking rock, and panning, among other things.

6.2 Gender and Community Issues

The culturally-based expectations of women compared to men in ASM communities also affect gender-based roles and responsibilities off the mine site. Outside of mining, women often perform key functions in the provision of goods and services (e.g. cooks, sex trade workers, merchants and shop owners, housekeepers, garden keepers, market women). Moreover, within the community, women are of fundamental importance in terms of food security and childcare and are quite often expected to meet family needs (e.g. education, health care) through what (often little) income they derive.

Within the community and at mine sites, women and men are differentially impacted by ASM in terms of their health, social and economic status, livelihood options, and social safety nets.

For instance, as a consequence of the low status of women in many societies and limited alternative survival strategies, the sex trade is prevalent in many ASM communities. In some cases, girls are enticed from extreme poverty-stricken situations to work in "night clubs". Initially, they are loaned money to escape their poverty but very few can repay their debts, particularly given the exorbitant cost of food and accommodation imposed on them (Veiga, 1997).

Given the prevalence of the sex trade, combined with the transient nature of ASM and often pervasive high risk behaviour, many ASM regions are plagued by high incidences of HIV/AIDS and other sexually transmitted diseases. For example, more than 70% of women interviewed in a major mining area of Kenya reported at least one incidence of venereal or sexually transmitted disease (Amutabi and Lutta-Mukhebi, 2001). In societies where wives are expected to submit to their husbands, the epidemic easily spreads throughout ASM communities. When the families' capacity to earn an income is weakened, girls are often taken out of school before boys to assist in care giving and meet other household needs (Fahlen, 2003). Due, in part, to HIV/AIDS, the number of female headed households – surviving on increasingly meagre resource - is on the rise.

As women are often expected to maintain household food security, the effects of ASM on the natural environment can significantly affect women's abilities to generate income and satisfy household needs. When engaged in agricultural activities, women typically undertake land preparation, sowing, weeding, harvesting, threshing, drying, pounding, food preparation for the family, looking after animals, and taking care of the children, to name but a few (Dutta Das, 1995). Also, women are typically the main providers of water and biomass fuels, and further rely on the natural environment for medicinal plants and resins. Thus, damage to waterways, agricultural lands and forests by mining activities can create additional household pressures, and this, in some cases exacerbated by other economic burdens, may drive women into mining to compensate (Hinton et al., 2003). On average, women in developing countries work at least 13 hours more a week than men (Dutta Das, 1995). Undertaking multiple functions, women as primary caregivers tend to look after their own needs after those of the family and are highly susceptible to illness associated with stress, exhaustion and poor nutrition.

Due to the direct link between women, family health and the natural environment, women can be highly effective in land management and particularly influential in advocating practices that prevent environmental damage and related human health effects. However, it is important to note that women and other groups are less likely to invest time and resources into more sustainable practices on land they do not own (Sass, 2002).

Other differential health effects relate to the roles of women and men at the mine site. In many cases, women undertake the bulk of manual crushing and grinding with little awareness of the potential for silicosis or pneumoconiosis. Advanced stages of silicosis have been documented among women and children as young as 14 in Ghana (ILO, 1999).

In the case of gold mining, when women are involved, they are quite often undertaking amalgamation and amalgam decomposition, making them highly susceptible to mercury poisoning by inhalation. In the pocket mines of Luzon Island, women who conducted in-house amalgam decomposition frequently had elevated levels of mercury accumulation in hair and exhibited symptoms, including kidney pain, respiratory problems, and dizziness (Murao et al., 2002). As most mercury awareness campaigns in the past have targeted men, and their education and literacy levels tend to be higher, women are often less aware of the risks of mercury than their male counterparts (Hinton et al., 2003).

In one case in Venezuela, death of an amalgam burner (attributed to mercury poisoning), prompted a site operator to hire an unknowing woman to replace him (Veiga, 1996).

Violence towards women is frequently reported in ASM communities throughout the world. In Guyana, rape of Amerindian girls by foreign miners and increased acts of aggression by Amerindian men has been attributed to the influence of miners and the “mining culture” (Anon, 2001). In Tanzania, women miners report the fear of sexual abuse in remote ASM areas and, in Suriname, Maroon women admittedly battle sexual harassment and other hardships only due to the lack of viable alternatives (Heemskerk, 2000; Machipisa, 1997). In Huaypetuhe in the Madre de Dios gold mining region of Peru, high crime rates and incidences of rape and violence are, in part, attributed to the absence of police and lawlessness common in many ASM communities (Kuramoto, 2001).

When men migrate to mining regions, they can return with modified values, sometimes weakening women’s position in the household. In the Sierra region of Ecuador, for instance, it has been documented that men return home with a greater sense of “machismo” than is traditionally observed in indigenous Sierrans (World Bank, 2000). The effects of migration may also weigh heavily on psychological well-being and physical health. In Mashonaland, Zimbabwe, factors such as change in diet and stress associated with leaving traditional lands (and breaking social ties in the process) was linked to negative health impacts on women who migrated to a mining region (Hunter et al., 2000).

In many cases, ASM communities earn average incomes far above neighbouring non-mining communities; however, there is often much disparity between residents of these communities and, in particular, between women and men. In Mgusu, Tanzania, miners in the pit (typically men) were less likely to be in extreme poverty than mine service providers (typically women) (Mwaipopo, 2004). In this community, however, female headed households, were not more likely to be in extreme poverty (as indicated by food security), as they were willing to undertake a multitude of activities that men “cannot or will not do”. Despite this, these female-headed families in Mgusu were unlikely to escape basic needs poverty (Mwaipopo, 2004).

Due to their low status in male dominated societies, women are compelled to carry out poorly paid work. Just because they are women, they cannot expect to be better paid. In a strict economic sense, the hiring of women miners is an attractive mean to lower operating costs. Clearly, mine owners are encouraging this practice. Furthermore, increases in household income do not necessarily equate with improved well-being of the family, particularly in households where men continue to control finances. Quite often, women’s work in the ASM sector is unpaid, and conducted to enhance the earnings of their husbands. In Kangaba, Mali, for instance, although women and men work side-by-side with men gold digging, Malinke tradition dictates that women turn over all gold to their husbands (Labonne, 1998). The same tradition typically applies to women in Kenya, although there are a number of examples where women manage family finances and give their husbands an allowance (Amutabi and Lutta-Mukhebi, 2001). Despite the expectation that women will turn over all profits to their spouses, in some Latin American mine

sites, they have been known to withhold products and revenues from their husbands, often through informal agreements with local buyers (Sandoval, 2002).



Photo 12: Malian Women at Work
(Photo by N. Jennings)

Many studies indicate that the revenue generated by women in artisanal mining contributes more directly to the well-being of households than that of men (UNDP, 1999; ILO, 1999, Veiga, 1997). Specifically, the income generated by women is more likely to be directed towards improving the quality-of-life in the family – *i.e.* through education, food, agriculture, etc. – whereas men tend to spend at least a portion of revenues on gambling, prostitution and alcohol (Hentschel et al., 2001). In addition, when women receive and manage earnings, their economic dependence on men may decline, thereby testing existing gender roles.

Both women as well as men embark in ASM as an opportunity to relieve the strains of poverty. However, in certain ASM regions where women have had more decision-making power and independent control of ASM revenues, specific contributions have been made to family and community wellbeing. In the village of Keana, Nigeria, where 100% of the mining workforce is comprised of women, revenues generated from salt mining have enabled mothers to sponsor their children to attend school at rates well above surrounding communities (Onuh, 2002). In the Laroo quarry region in Gulu District of Uganda, women are also predominantly engaged in mining, prompting a shift in gender roles that has enabled them to control family finances (Anon, 2004).

Lack of access to land is a key determinant of poverty, not only due to its relevance in terms of ownership of products, but also in terms of collateral (World Bank, 2000). In Kenya, Zimbabwe, Burkina Faso and Cameroon female miners are, in some cases, legal holders of land title, yet control of the land and thus mining activities are in the hands of men (Amutabi and Lutta-Mukhebi, 2001; Sass, 2002). When men control the land, they also tend to dictate women's roles in production; as a result, they are usually consigned to transporting, washing and panning, and turning over the profits. Barriers on women's land rights hinder their ability to access other resources. In certain countries, this inequity is further exacerbated by laws that stipulate that women cannot take out a loan without the consent of her husband or father, as is the case in Botswana and Lesotho (Carr, 1993). Many countries have reformed their heritage laws so that women can inherit or buy land. In these cases, women land owners are less likely to seek poorly paid employment in ASM.

6.3 Key Issues and Priorities

In many cases, the roles of women in ASM communities differ significantly from those of men, and extend well beyond direct participation in mining activities – this added facet brings with it different contributions and a unique set of risks and opportunities. Main issues in resolving gender inequities in ASM include the following:

Gender and Voice

In order to advance gender equality in ASM, key governance issues pertain to the effectiveness of policy and legal instruments to measure progress. Issues such as land rights, both for mining and agriculture, representation of women in decision-making processes, and an institutional environment that is conducive to participation by women are of paramount importance. Policies or socio-cultural traditions that restrict or deter women from obtaining concessions or land rights and prevent women from participating in decisions affecting land use further contributes to the feminization of poverty. Incorporation of women into decision-making, *both formal and informal*, is a critical factor in the development of gender-sensitive policies and successful implementation of any programme that modifies the use of resources, such as ASM.

Policy is not the same as practice. Even when opportunities – ranging from education and health services to financing and property ownership - are legally available to both men and women, socio-cultural barriers prevent their equitable access. For example, male-dominated mining ministries may be difficult to approach for many women, a situation made even more difficult by their limited resources (time, money transportation). Diversifying their workforce and sensitizing their services, for instance providing outreach to ASM communities, may aid in overcoming this barrier.

Women's associations and organizations have an important role to play in advocating for the empowerment of women. The SADC Women in Mining Trust, for instance, has members in Angola, Botswana, Namibia, Congo DR,

Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe (Hentschel et al., 2001). The Trust seeks to respond to women's training needs, institute revolving loans, and to increase support for women from companies, governments and other programmes. Other organizations including the African Women in Mining Network (AFWIMN), the 7,500 member strong Association of Women Miners in Bolivia, and hundreds of smaller associations in villages throughout the world create a strong voice for women in ASM communities.

Gender and Health Status

The health of women and men is differentially impacted by ASM. The linkages between gender-differentiated roles (both at mine sites and in communities), health status and food, personal, economic and environmental security must be recognized by policies and programmes aimed at improving health and wellbeing in ASM communities. Maternal health is a critical issue in many developing countries and ASM advocates should seek to partner with health- and development-based organizations to address this in ASM communities where women may be particularly vulnerable. In addition, the gender dimension of HIV/AIDS and its compounding effects on the family and community wellbeing is a clear priority in the ASM sector.

Gender and ASM Revenues

Women and men generally derive different economic benefits from ASM (directly or indirectly), both in terms of income disparities or control of household income. Expenditure patterns of these revenues also vary. In many cases, control of household income signifies an ingrained socio-cultural barrier. Raising awareness of women's rights through sensitization campaigns, educating local formal and informal religious and political leaders, and disseminating positive case studies on the advancement of women in ASM communities represent a starting point. Supporting development of non-mining livelihoods for women may serve to further bridge the income inequity gap.

Gender and Development

Past ASM assistance efforts have made a major oversight in not recognizing the gender-specific nature of development. By assuming that "what is good for men is good for their families", most programmes have been oriented towards the tasks, interests, and needs of men (Hinton et al., 2003). The focus on commercial rather than domestic benefits of some development programmes has resulted, in some cases, in reduced quality of life for women (Everts, 1998, Wightman, 2001; Wakhungu and Cecelski, 1995).

As women's direct involvement frequently decreases with increased scale and mechanization of a mining operation, it is easy to speculate as to how technical assistance programmes could impact women. Incorporation of women in programme development and implementation represents an important opportunity for technical assistance programmes to build upon the demonstrated successes and failures of past efforts. It is a fact that in many ASM societies, women are at the "bottom of the pile" in the ASM business. By participating in ASM, they lose whatever traditional social status they once had and often gain nothing in return. Technical assistance programmes tailored to

women could make an important contribution to enhancing the social status of women.

The narrow focus of many ASM interventions on mineral rather than community development has overlooked the considerable opportunities associated with women engaged in non-mining livelihoods. Prospects may relate to activities downstream from mining, marketing of agricultural products, service provision and other small enterprises. The balance between more traditional obligations (e.g. childcare) with income generating activities should be considered in these endeavours.

6.4 Opportunities for Change

The Millennium Development Goals (MDGs) represent, among other critical goals, a collective commitment to halve world poverty by 2015. As the third of eight goals, the “promotion of gender equality and empowerment of women” should be a core component of any development agenda, including those aimed at the ASM sector. In addition to recognizing the important roles of women in ASM, the sector should be acknowledged as an important livelihood activity, capable of reducing poverty (Lahiri Dutt, 2004). Despite stated commitments by governments and ASM interventions, progress towards gender equity is uncertain. There is a clear need for mechanisms to measure and evaluate policy impacts in order to ensure that talk actually equates to action. Clear targets and objectives are needed.

Gender-based roles and responsibilities are fluid and can shift over time, space and in different contexts (Butler, 1990). Fortunately, gender inequities are also dynamic – barriers can be broken, bringing about positive change in terms of human development. With the ultimate goal being gender equality, gender mainstreaming is key step to facilitating this change (Box 2). Gender mainstreaming entails the assessment of implications for women and men of any planned action, including legislation, policies or programmes. It requires making the concerns and experiences of women as well as of men an integral part of the design, implementation, monitoring and evaluation of policies and programmes.

This includes a gender-based analysis of social and labour issues by:

- Examining gender- based differences in labour market participation,
- Understanding women's and men's constraints and opportunities in relation to knowledge and skills, conditions of work, social protection, family responsibilities, and economic and political decision-making,
- Reviewing the different implications for women and men of the proposed solutions, and
- Developing clear targets and mechanisms for measuring progress.

Within the context of gender inequities in ASM and human development in general, the following represent key opportunities for change (*after* Lahiri Dutt, 2004, Hinton et al., 2003):

- Inclusion of ASM in national poverty reduction strategies with recognition of its livelihood significance and the gender-differentiated impacts and benefits for those both directly and indirectly involved in the sector;
- Commitment to gender mainstreaming in government agencies, and appropriate recognition of women in policy frameworks, particularly in relation to land ownership rights;
- Adoption of strategies inclusive of, and accessible to, both women and men, and which support women's participation in political decision-making;
- Formal gender mainstreaming in technical assistance and ASM community development programmes;
- Increasing the visibility of women's work (both mining and non-mining related) by undertaking gender audits of ASM projects;
- Elimination of discrimination from educational systems, and provision of support for families sending children to school;
- Promotion of micro-credit and other programmes that provide financing for women engaged in mining as well as other economic activities;
- Execution of educational campaigns that target women in order to mitigate specific health risks and provide the means for them to access other resources;
- Implementation of programmes to train women in various aspects of mining, as well as in marketing, management and bookkeeping;
- Promotion of non-mining livelihoods, including downstream and complementary activities; and
- In-depth gender-sensitive research on the differential impact of current practices and technical change on the lives of both women and men in ASM communities.

Due to their importance in terms of mineral production and provision of vital community services, in conjunction with their susceptibility to poverty, better understanding the roles of women and men as well as the gender-differentiated impacts and benefits of ASM may be an effective means to design more effective strategies facilitate positive change in ASM communities.

While there is no universal approach, gender mainstreaming is a critical instrument in highlighting the contribution of ASM, in using its potential as a tool for poverty reduction, and in creating sustainable livelihoods for local communities. Critical to this, ASM economies need to be reconceptualized, using micro-level measures and participatory approaches (Lahiri Dutt, 2004). Women are critical to community stability, cohesiveness and morale, and act as primary agents in facilitating change – thus, their empowerment should be central to any ASM efforts (Hinton et al., 2003).

Box Two: Gender Mainstreaming – Towards a Project Strategy

At the 2004 CASM AGM in Sri Lanka, a workshop was held to identify the key needs and constraints to gender mainstreaming in ASM. The workshop recognized that ASM is unlikely to achieve its poverty reduction objectives if the concerns of both women and men are not incorporated within all programmes and projects. Recommendations from the workshop are summarized as follows.

GENDER MAINSTREAMING:

Gender mainstreaming involves assessing the implications for women and men of any planned action, including legislation, policies or programmes. It requires that the concerns and experiences of women as well as of men are an *integral part* of the design, implementation, monitoring and evaluation of policies and programmes.

KEY COMPONENTS:

1. **Raising awareness** of men and women, as well as local, national and international organizations including government agencies, NGOs, CBOs, religious organizations and donor agencies. A strategy for raising awareness may include:

- Implementation of formal information campaigns at various levels;
- Participation of women and men in all phases of projects; and
- Disseminating positive case studies on the advancement of women in ASM communities.

It is evident that efforts must be taken to overcome discriminatory social taboos and traditions.

2. **Equitable Participation** of women and men in projects is critical. Specifically:

- Male *and* female field staff should jointly undertake community-based project work;
- Male and female formal and informal leaders should be identified and included; and
- Meetings and discussions should be held with both men and women – together and separately – to ensure all voices are being heard.

3. **Baseline Studies** require collection of qualitative and quantitative data on:

- Gender based differences in labour market participation; and
- Constraints and opportunities for both men and women in terms of advancing gender equity.

Collection of sex-disaggregated data is not sufficient to ascertain the differential impacts and benefits of mining on men and women!

4. **Implications of Projects and Programmes** on women and men should be assessed prior to implementation. Diagnosing the gender implications will support both project success and gender equity as both women and men will be targeted project beneficiaries.

5. **Governments** should evaluate and adapt inappropriate, gender-exclusive policies, particularly those that address land rights and the right to work. Further, Mining Departments and extension offices should be staffed with both men and women to ensure accessibility of services to women and men. Government agencies should also participate in gender awareness raising efforts in ASM communities.

6. **Networks** of women in ASM communities should be strengthened and resourced through current efforts in the formalization process and other community-based projects. Women are less likely to be included in associations than men and networks may provide a source of support and advocacy.

7. **Training Projects** should target women as well as men and allow both groups to have equal choice of livelihood options.

8. **Livelihoods Programmes** must be directed at women as well men in order to improve wellbeing and support diversification. Microfinance has been significantly more successful with women than men and should be explored as a means to facilitate this.

The ultimate goal of gender mainstreaming is gender equality!

7 CHILD LABOUR

“Children working in mines and quarries risk their health, their safety and their futures” (ILO, 2005)

Working with the ILO and in particular, the International Programme for the Elimination of Child Labour (IPEC), CASM has recognized that child labour in ASM represents a major breach of children’s rights. Through special workshops at CASM AGMs and Learning Events and a joint CASM-ILO Thematic Meeting on the Evaluation of Action on Child Labour in ASM¹⁶, considerable insight has been derived on the constraints and opportunities, failures and achievements in eliminating child labour in the sector.



Photo 13: (a) Malian Child Gold Miner and (b) Children in Pakistani Coal Mine
(Photos by N. Jennings)

7.1 The Scale and Nature of Child Labour

IPEC has recently estimated that about 1 million children under 18 are currently engaged in ASM throughout the world, fairly equally divided between boys and girls. Eliminating this relatively small number of children from one of the worst forms of child labour is an achievable goal. In some cases, work can begin at age 3, with children performing a range of functions from digging and hauling to washing sediment, burning amalgam, and performing support tasks, such as brick-making, hauling water, and cooking. There is a clear gender-differentiation in child labour, with boys mainly undertaking digging and/or hauling while girls work in mineral processing and mining related services (IPEC, 2004).

¹⁶ Additional information on the CASM-ILO Joint Meeting can be found at <http://www.casmsite.org>.

There are three main forms of child labour in ASM, each of which has different features and implications (*after* Gunn and Priester, 2004).

- *Bonded Child Labour* where children are contracted out as a cheap source of labour or are given away as guarantees for or payment of loans;
- *Child Labour within a Family Context* occurs when the whole family is engaged in ASM. In this case, children contribute to household income and, in some cases, work in place of adults. Often, ASM is viewed as a training ground, which builds skills; and
- “*Self-employed Child Labour*” in ASM is frequently a survival strategy for, in particular, orphans of war or disease. In this case and bonded labour, children are highly susceptible to exploitation and general mistreatment, as well as malnutrition.

As mining activities are often illegal and usually occur in rural areas with little social infrastructure and inadequate living conditions, exploitation of children is difficult to monitor and regulate (Gunn and Priester, 2004, IPEC, 2005). In many cases, education and social development are neglected, leaving few options for the future livelihoods and wellbeing of children.

7.2 Impacts of ASM on Children

Due to the extent and nature of hazards and high risks of death, injury and disease prevalent in ASM, ILO has, through Convention 182, classified child labour in mining as a “Worst Form of Child Labour” (IPEC, 2005). With less experience in mining, a comparative lack of maturity, and, in many cases, little guidance from adults at the site, ASM can be particularly perilous. Key occupational health issues include (*after* Gunn and Preister, 2004; IPEC, 2005; Wasserman, 1999):

- Exhaustion, musculo-skeletal damage and back pain due to hauling heavy loads;
- Hardening of hands and forearms, cuts and bruises, and dust inhalation in association with manual crushing and grinding of rock;
- Exposure to mercury, cyanide, acidic drainages and other toxic chemicals, particularly during mineral processing;
- Increased risk of communicable diseases due to poor sanitation and lack of clean water at ASM sites;
- Thermal damage due to working without protection in extremely cold or hot conditions;
- Injuries and fatalities from machinery and equipment, as well as exposure to related chemicals (i.e. petrol, diesel, oil); and
- Stress from working under arduous conditions.

Children in ASM face the same occupational, environmental and community health risks as adults (Ch. 4), but are generally more susceptible to these hazards for a number of reasons. Children develop – physically and emotionally - very quickly. During this critical stage of their lives, carrying of heavy loads, long work hours and frequent injuries, combined with lack of rest and proper nutrition can significantly affect child growth and development.

Pound for pound children eat, drink and breathe more than adults, resulting in relatively higher doses of any environmental contaminant (WHO, 2005). Children are less efficient than adults at detoxification and small exposures can cause profound developmental effects that may not be evident until long after exposure. In the case of mercury use in gold mining, exposure through inhalation can delay development and cause learning disabilities, produce dysfunction of kidneys and the urinary tract, induce vomiting, and, potentially, lead to death. In Mongolia, almost 80% of gold miners burn the amalgam in family kitchens with children watching (Mongolmaa, 2004). When mercury pollution has led to food chain impacts, frequent ingestion of mercury-contaminated foods can cause visual constriction; numbness of the extremities; impairment of hearing; impairment of speech; and impairment of gait. In cases of acute intoxication, muscular atrophy, seizures and mental disturbance are prominent.

When children are employed separately from their parents the risk of intimidation and violence increases (Jennings, 1999). Girls are somewhat more susceptible to sexual exploitation than boys, and child prostitution is common, in part due to the status given to virginity, but also as young girls are deemed unlikely to carry HIV/AIDS or other sexually transmitted diseases (Veiga, 1997). In the Simanjiro District of Tanzania, where the majority of tanzanite miners are children between the ages of 8 and 16 years, 40% of the workforce is comprised of girls who are involved mostly as domestic and commercial sex workers (Mushi, 2004).

Work in ASM typically equates to a denial of their right to education. In many cases, from Peru to Papua New Guinea, children do not attend school due to the associated expenses and loss of family income. Even when primary school is completed, children may abandon secondary school as it is perceived to offer poor prospects and, particularly as they get older, children are increasingly expected to provide for themselves (Mosquero, 2004; IPEC, 2005). In Tanzanian mining sites, more than 70% of children were forced to drop out of school and work (IPEC, 2005). In the stone quarries of Nepal, the majority of the more than 10,000 child labourers are girls, the majority of which are illiterate and earn less than US\$ 0.85 per day daily (Pradhan, 2004). With most from a socially discriminated and impoverished caste, these children have little opportunity to attend school and break the poverty cycle in which they are immersed.

Further to this, parents often have little awareness of the formative value of recreation and play (Mosquero, 2004). Team building skills, relaxation and peer support are just a few of the benefits. In the Nepalese stone quarries, more than 65% of children work 9-10 hours daily, leaving little time for recreation (Pradhan, 2004).

There is no justification - poverty included - for children to work in ASM (Gunn and Priester, 2004; ILO, 2005; IPEC, 2005). Children and their families justify child labour in ASM in many ways. Poverty is the main cause but lack of awareness, the value of work in terms of skills building and the desire for, in particular, older children to have their own money also figure prominently (IPEC, 2005). The decision of families to engage in child labour requires many

trade-offs (Fig. 5). Tipping the scale is therefore one of the main objectives of efforts to eliminate child labour in ASM.

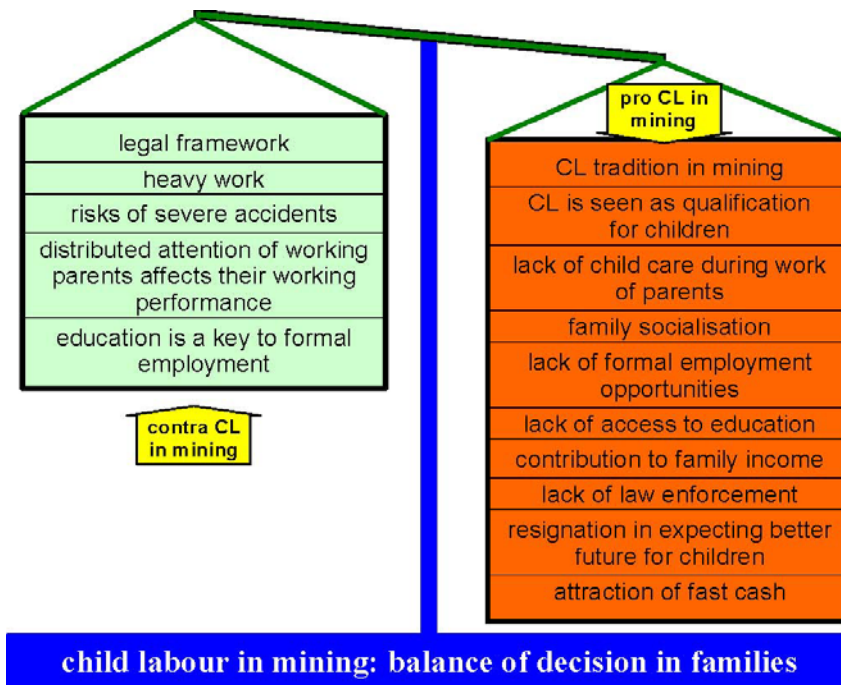


Figure 5: Child Labour and Family Decision-Making (Source: IPEC-ILO, 2004)

7.3 A Strategy for the Elimination of Child Labour

ILO has been a driving force in advancing the elimination of child labour in ASM. Since 1995, when ILO set mining specific standards through the Safety and Health in Mines Convention (No. 176), and 1999 and 2002, when ILO tripartite meetings recommended action against child labour in mining, ILO has developed and advanced a “thematic evaluation” to guide future efforts in ASM. IPEC, with considerable financial support from donor governments, has implemented a number of technical cooperation projects to clearly point a way forward in terms of policy and on-the-ground practice. Current efforts are founded in the recognition that the poverty central to child labour is intrinsically linked with the poverty central to ASM. Thus, integrated and multi-faceted strategies have emerged to address the challenges not only specific to child labour, but those plaguing impoverished rural populations and the ASM sector on the whole. Through these approaches, examples from India, Tanzania and Peru demonstrate that child labour in ASM is a problem that can be solved.

Case Study: Markapur, India

In the Andhra Pradesh region of India, almost 1.4 million children were engaged in child labor in 1991 (Joseph, 2004). Prior to the IPEC programme, around 9000 children were actively mining in the slate quarries and working in slate processing factories in and around Markapur. In pits, children were involved in carrying waste material to the surface for 6 hours daily for roughly

US\$ 0.23 per day. Approximately 70% of workers were girls, mainly between the ages of 6 and 15 years (Joseph, 2004).

Between 1988 and 1998, the Government of India's National Child Labour Project (NCLP) ran 20 schools in 25 villages through which they rehabilitated 1000 children per year from work in the slate mines. Despite these efforts, the child labour force in the slate mines of Markapur remained at around 6000. Between 1998 and 2004, the ILO-IPEC project implemented an integrated programme in forty villages in Markapur comprised of interventions targeting (Joseph, 2004):

- *Prevention:* A sustained campaign involving parents, teachers and others to send all 3-8 year old children to pre-schools and schools. Approximately 6000 children attended school as a result.
- *Rehabilitation:* Approximately 2500 children were removed from the mines and sent to one of 80 transitional schools for a 2-3 year period until mainstreaming into government schools. Children were given uniforms, books and a hot lunch. About 500 children, aged 13 to 16 years, were withdrawn from the mines and given skills training.
- *Livelihood Support:* More than 2500 mothers of former child labourers were trained in microenterprises and provided assistance in their establishment. As well, 182 women's self-help groups were formed to facilitate revolving funds from microcredit and government sources.
- *Environment Building:* Trade unions and mine operators were sensitized to, respectively, take a strong stand against child labour and hire adults in lieu of children. Pit owners were encouraged to mechanize to replace child labour. Committees were established between trade unions, government, and employers in order to sustain the progress achieved through the programme.

Community involvement throughout the programme has supported village-based monitoring of child labour, pit owners have recognized the benefits of the changes they have implemented, and the local government has opened additional schools in the region. With the elimination of child labor in the forty target villages and reductions in outlying slate mines not specifically targeted through the ILO-IPEC project, this programme has emerged as an impressive model for the elimination of child labour in ASM.

Case Study: Simanjiro District, Tanzania

Tanzanite was discovered in the Merelani Hills of Simanjiro District, Tanzania, in the 1960s. Subsequent development in the area, catalyzed by a tanzanite rush, saw the influx of thousands of miners, including children. In Simanjiro, children aged 8 to 16 years work in both the pit and at the surface. The labour force is comprised of 60% boys, who work in pits and tunnels as deep as 200 metres carrying heavy loads, setting explosives, and sieving sands (Mushi, 2004). The remaining 40% of the workforce, young girls, undertake domestic work (e.g. cooking, cleaning) and participate in the sex trade.

This programme saw the removal and rehabilitation of 125 children and prevention of 350 "high-risk" children from entering the mining workforce in the district (Mushi, 2004). Following an IPEC assessment in 2001 that deemed child labour in ASM in Simanjiro a high risk, a joint World Vision-Time Bound

Programme¹⁷ (TBP) was undertaken to achieve the following goals (Mushi, 2004):

- To prevent the introduction of 1,500 “high risk” children at risk entering the mining workforce;
- To withdraw and rehabilitate 1,000 children engaged in ASM; and
- To empower 300 poor and vulnerable families of the targeted children.

Following a similar integrated model as that put forth by IPEC, the World Vision-TBP programme has supported local awareness campaigns and mobilization of the community, community capacity building, strengthening of networks, psychosocial support for the repatriation of children, and training and educational programmes for the children involved in the programme.

Thus far, the project has made some notable achievements (Mushi, 2004):

- 600 “at-risk” children prevented from becoming child labourers in mining;
- 470 children withdrawn from child labour in ASM;
- 120 poor, vulnerable families identified for economic empowerment efforts; and
- 1,200 people in 23 villages were sensitized through awareness campaigns and seminars.

Barriers to progress include the influx of children into the region to work in the mines, which has increased demands for the services of the programme. In addition, poverty is increasing in the district and poor infrastructure and weak enforcement of education and child labour by-laws hinders programme progress (Mushi, 2004).

Solid support from local government and communities has been important to the accomplishments made thus far. However, additional support is urgently required by way of financial resources to respond to the large numbers of child miners and added capacity building needs of local communities. The inclusion of child labour in district development plans and budgets would assist significantly (Mushi, 2004).

Case Study: Bolivia, Colombia, Ecuador and Peru

A massive campaign to eliminate child labour in ASM has been undertaken in four countries in Latin America. In these countries, children are mainly engaged in ASM in conjunction with their families (Mosquero, 2004). Due to prolonged mining traditions, ASM communities have become accustomed to the environmental, human health and social problems – including the participation of children. Despite recognizing the many risks of ASM, parents believe that child labour makes an important contribution in terms of character development, skills training and risk management (Mosquero, 2004).

The intervention approach employed is based on an integrated sustainable development framework with efforts targeting major ASM issues at the household, community, mining area and national level. In the nine ASM regions in four countries, with main project components completed or

¹⁷ The ILO *Time Bound Programme (TBP)* assists countries in fulfilling their obligations under the ILO Worst Forms of Child Labour Convention (Convention 182). This is undertaken within an agreed upon time period (e.g. 5 to 10 years).

underway are described as follows (Mosquero, 2004):

- Development of national and local public policy (7 of 9 regions);
- Community awareness-raising/mobilization (9 of 9 regions);
- Appropriate technological changes as a substitute to child labour in small-scale traditional mining (4 of 9 regions);
- Improvement of mine safety and health conditions (6 of 9 regions);
- Generation of complementary family income (8 of 9 regions);
- Development of education and other services for children and adolescents (9 of 9 regions); and
- Use of free time in recreational, sports or cultural programmes (9 of 9 regions).

Key products include policy changes at local and national levels marked by the inclusion of child labour, a tracking tool to monitor families with children withdrawn from ASM, guidelines for institutional action, and increased networking and cooperation with other agencies and institutions throughout Latin America (Mosquero, 2004).



Photo 14: A Peruvian Child Mining Gold
(Photo by ILO)

Child labour in ASM *can* be eliminated. The number of children engaged in ASM is significant but not prohibitively high (IPEC, 2005). On the World Day Against Child Labour on June 8, 2005, fifteen countries along with representatives of the mining industry (ICMM), mining trade unions, and CASM promised to support the elimination of child labour in ASM by 2015. Families, local communities, government agencies, trade unions, miners associations, NGOs and international aid agencies have demonstrated the motivation and resolve to achieve this goal. Now it is time to turn this determination to commitment and commitment to action in order to eliminate child labour in ASM once and for all.

Box Three: Elimination of Child Labour – Towards a Project Strategy

At the 2004 CASM AGM in Sri Lanka, a workshop was held to discuss key issues concerning the elimination of child labour in ASM in ASM. Workshop participants indicated that the methods for addressing child labour are well established and, with the child workforce in ASM numbering around 2 million, total elimination in ASM seems a feasible objective, particularly in comparison with other sectors (e.g. agriculture). Further, it was indicated that all concerned – families, local community leaders, politicians, mine owners, trade unions – can appreciate that this is a problem that needs solving.

The workshop discussion identified the following key components of a strategy to eliminate child labour:

(1) Raising awareness – Changing mindsets is a main challenge in the elimination of child labour. Tradition says that a family working together is a perfectly satisfactory means of keeping food on the table and learning trades, but in the context of ASM, where risks to children are unacceptably high and education is critical for their futures, this belief no longer applies. The children being exploited, their families, governments, local leaders, and the international community, as well as mine operators, need to be sensitized. Careful study of the cultural and economic context is crucial to this.

(2) Integration with development – Action against child labour in ASM does not have to stand on its own. It can piggyback on industry training, rural development, trade union activities, HIV/AIDS programmes, other child labour projects such as child soldier integration efforts, and even routine school programmes.

(3) Education and vocational training – It is not a question of merely ending child labour but of providing alternatives. Schools must be available and many innovative models are known (e.g. transitional schools). However, basic education is not enough – training in vocational skills, geared to the realities of the local market, is probably the most important intervention from the perspective of the families concerned.

(4) Economic empowerment through decent work – The best long term, sustainable way to eliminate child labour is to create decent work for adults. Strategies include making ASM more profitable; engaging large formal mines with the issues confronting ASM; income-generating activities for families, especially women; instituting appropriate technologies that reduce child labour; reviewing local legislation regarding ASM for consistency with ILO C.182; and developing effective measure for enforcement through capacity-building of inspectors.

Immediate actions identified by workshop participants included qualitative and quantitative information on the location, nature, context and scope of the problem of child labour in ASM, and local demonstration projects to overcome the sense that “it cannot be done.” Projects in different contexts would demonstrate that child labour in ASM can be eliminated.

8 LEGALIZATION, FORMALIZATION AND ORGANIZATION

At the 1995 International Roundtable on Artisanal Mining, it was concluded that none of the challenges facing the ASM sector could be overcome until a prime need was met: legal titles (Barry, 1996). A critical precursor to advancement of the ASM sector, enabling legislation provides a foundation for change. Ultimately, however, artisanal and small-scale miners will choose to work within a regulatory framework only if (a) they have the capacity to participate; and (b) it is obviously advantageous to do so.

Although the legal and regulatory environment lays the groundwork, it is formalization efforts that provide the necessary incentives and mechanisms for support, while organization provides the vehicle through which support can be provided. This tripartite approach has become the hallmark of many integrated policies and programmes to improve the environmental, social and economic performance of ASM.

8.1 Artisanal and Small Scale Mining Laws

The importance of creating an enabling environment for legalization of the ASM sector is increasingly being recognized by legislators throughout the world. Most legal frameworks, however, have achieved only marginal success in executing laws and regulations appropriate to the sector. Fundamental factors that impede the development and implementation of suitable legislation include an inability to come to agreement on how these activities should be defined and licensed (i.e. on the basis of concession size, mineral production, capital cost expenditures, degree of mechanization, etc.), overly bureaucratic and complex procedures, conflicting mandates of multiple regulatory agencies and inadequate government resources.

Some governments lack the political will to develop enabling ASM legislation. In some cases, government officials may benefit directly from the informality of ASM through corruption, using ASM as a means to launder money or extort funds from illegal miners. More frequently, however, legal ASM activities are perceived as a deterrent to investment by multinationals. Given the considerable tax revenue derived from large-scale mining, favouritism towards larger, formal producers precludes development of appropriate ASM policies and regulations. Reliance on large-scale mining can be substantial. For instance, the Freeport-McMoran gold and copper mine in Irian Jaya (formerly West Papua) is the single largest source of tax revenue in Indonesia (Runyan, 1998), the Yanacocha Gold Mine has contributed more than \$260 million in income tax revenue to the Peruvian government since commencing operations in 1996 (Newmont, 2003), and large-scale mining activities contribute more than 41% of the foreign direct exchange earnings in Ghana (Awudi, 2002).

Many governments are now seeking to advance *both* large-scale, formal mining and ASM. With recognition that not all deposits are suitable for large-scale extraction, best use of many natural resources in many cases means support for ASM activities. This, combined with the employment generating potential of ASM, its assumed capacity to stimulate rural economies and its prospective

contributions to taxes, royalties and foreign exchange earnings, have compelled some exceptional governments to institute much-needed policy reforms. Efforts have ranged from distinct legislation solely for ASM to less advanced stipulations in existing mining laws and regulations to the omission of ASM from legal frameworks in lieu of provision of special licensing and registration mechanisms for ASM operators (Bugnosen, 2002).

Legislation varies somewhat from country to country, but often includes provisions for the following (*after* Bugnosen, 2002, Hentschel et al., 2001, UNECA, 2002):

- Definitions of ASM;
- Streamlined licensing procedures;
- Simplified environmental impact assessments and protection plans;
- Transparent, first-come first-serve allocation of mineral rights;
- Renewability and transferability of mineral rights;
- Upgrading of mineral rights (for instance, from an ASM concession to larger scale mining leases); and
- Limitations of rights to nationals.

Few regulatory frameworks make a distinction between “artisanal” and “small-scale” mining. In Ethiopia, however, miners are able to obtain either an “artisanal mining lease” or “small-scale mining lease”, which are differentiated on the basis of duration of tenure and concession size (UNECA, 2002). The heterogeneous needs of the different constituents of the sector have been considered through alternative licensing procedures in various jurisdictions. Bugnosen (2002) identified six types of ASM licenses, as follows:

- *Informal or Undocumented Licenses*: Typically granted for non-commercial ASM activities (e.g. industrial mineral extraction for personal housing construction), these licenses seek to assist indigenous groups and landowners;
- *Strata Licensing*: Rights are provided to a specified depth (e.g. 15 m in Ethiopia, 50 m in Papua New Guinea);
- *Group Permitting*: Using simplified registration procedures, associations or cooperatives of miners are permitted to mine in specified areas;
- *Licensing by Mineral Commodity*: Licensing requirements vary depending on the mineral being mined. Industrial or building minerals are often classed differently than high unit value commodities (gold, diamonds, gemstones). Frequently, industrial minerals licenses are regulated by local authorities, while other minerals are under the mandate of the central government;
- *Staggered and Single Licenses*: Staggered licensing requires separate permits for each stage of mining (e.g. prospecting, exploration, extraction), while single licenses span activities from exploration through to production and marketing; and

- *National or Local Government Licenses:* As an alternative to licensing falling under either a national or local jurisdiction, in some cases, miners must follow regulations and licensing procedures at both a state and national level.

In terms of environmental requirements to obtain and maintain an ASM licence, many legal frameworks stipulate completion of simplified environmental assessments or statements, monitoring and reclamation of mine sites. However, requirements for surety bonds or environmental taxes for environmental protection have also been instituted in some countries (e.g. Guinea and Zambia).

Legal ASM operations generally must adhere to a multitude of multi-agency regulations with intersecting and often contradictory responsibilities – this has created a major hurdle for both compliance and monitoring of the sector. Issues such as community health or occupational health and safety are, quite often, addressed by broader regulations applicable to both the large and small-scale sectors and in some cases fall under the mandate of multiple government authorities, including Ministries of Mining, Health and Labour (Bugnosen, 2002, Hinton, 2005). Tanzania, however, has sought to overcome these confusing and overlapping mandates with the development of ASM-specific regulations. By providing a simplified and comprehensible framework that jointly addresses environmental protection, occupational health and safety and child labour, the simplified Tanzania ASM regulations increase the likelihood of compliance by legal miners (UNECA, 2002).

The overlapping interests between ASM and formal miners (small, medium and large-scale) present a unique challenge. Although a transparent and judiciously managed mining sector brings considerable clarity in terms of these interests (for instance, through granting of limits on duration of tenure), encroachment of miners onto formal concessions continues to be problematic. “Non-competition clauses” between artisanal and small-scale miners have been proposed in some countries wherein somewhat mechanized small-scale mining complements labour-intensive artisanal activities. At specific sites in Burkina Faso, for instance, it has been proposed that this could be facilitated through the allotment of specific resource components to each group (i.e. residual, un-mined ore and mineral-rich tailings from artisanal activities worked by small-scale miners) (Jacques et al., 2002).

Alternative models of licensing, for instance the allocation of demarcated areas for ASM, is provided for in the legislation of most African countries. Although the tensions between concession holders and illegal artisans must still be reconciled, if regions of suitable mineral potential can be identified, this, coupled with other incentives could effectively encourage migration of artisans to demarcated areas and satisfaction of both parties. Originally instituted to respond to rush-situations or encourage mining of small deposits, legislation concerning the designation of ASM reserves has been initiated in Ghana, Tanzania and Brazil (UNECA, 2002).

Most legal measures to develop, rather than impede, ASM activities have been relatively recent. The international community is avidly scrutinizing these endeavours in an attempt to learn and build on these experiences. With

relatively advanced and in some respects very different ASM laws and regulations in place, insight can be yielded from legal frameworks put forth by the governments of Peru, Sri Lanka and the Philippines.

Case Study: Peru

The mining code in Peru was initially developed to facilitate large-scale, multinational investment in the country. Since then, the code has been adapted to recognize ASM on the basis of title area and production capacity. Specifically, artisanal mining refers to daily extraction and processing of less than 25 tonnes in less than 1,000 hectares of land, while small-scale mining must extract and beneficiate between 25 and 350 tonnes daily on 1,000-2,000 hectares (Medina, 2002). Licenses can also be granted for construction materials with extraction limits of 200 m³ per day and 3,000 m³ per day for artisanal and small-scale operations, respectively.

Streamlined registration requires completion of a simplified environmental impact assessment and, given that activities are not proposed for lands within national parks or where titles have already been granted, individuals or associations can receive preferential land rights provided registration with the Dirección General de Minería (DGM). Maintenance of licenses requires minimum production volumes and adherence to environmental regulations, violation of which draws penalties and fines (Medina, 2002).

Case Study: Sri Lanka

In Sri Lanka, where more than 160,000 people are involved in various aspects of the gem and jewellery industry, the legal process to attain the right to mine favours ASM (Dharmaratne, 2004). Large-scale mechanized mining is prohibited and heavy equipment (e.g. bulldozers and backhoes) can only be used in certain situations. As a disincentive to mechanization, heavy machinery use demands a fee between 5 and 25 times that of a “machinery-free” site.

In order to obtain a licence from the National Gem and Jewellery Authority (NGJA), two-thirds shares should be held in the land or it can be leased from an owner (Dharmaratne, 2004). Subject to clearance of land ownership, a one-year (renewable) licence can be issued in only 2-3 weeks. In addition to a US\$ 10 licensing fee, operators pay US\$ 10 fee for site reclamation, which is refundable pending acceptable restoration of land. The NGJA further encourages mining by holding auctions for gem-bearing sites on crown land or in waterbodies. In 2003, 486 blocks were auctioned for gem mining. These legal conditions have resulted in issuance of 3702 gem mines licenses in 2003 and a relatively low proportion of illegal miners (around 20%) (Dharmaratne, 2004).

Additional Sri Lankan legislation concerns adding value to gemstones. In 1980, Thai Nationals had exclusive gem exporting rights, a law which was annulled in 1993 (Dharmaratne, 2004). Since then, only heat treatable rough gems can be exported, requiring in-country value added processing. Import of gemstones, either rough or cut and polished, are duty free, as are gold, silver and gem processing equipment. As an added incentive, income from supply and export of gems is tax exempt (Dharmaratne, 2004). In 2003, licenses were granted for 255 lapidaries and 2917 gem dealers.

Case Study: The Philippines

More than 300,000 artisanal and small-scale miners are active in the Philippines, two-thirds of which are engaged in gold mining. Almost 100% of the Philippines industrial minerals and up to 80% of its gold are produced mainly through ASM (Bugnosen, 2004). In recognition of its economic and social significance, the government has instituted a number of laws pertaining to gold panning and sluicing (PD 1150), mining of small deposits (PD 1899), identification and segregation of ASM zones (RA 7076) and ASM mine safety rules (AO No. 97-30). In addition, miners can obtain a range of renewable permits, which can be granted for one to three year periods contingent on limited production, non-mechanization, explosives bans, and exclusion of child labour (Bugnosen, 2004). Permits are commodity specific, addressing gemstone gathering, gold panning and sluicing, commercial and gratuitous guano extraction, commercial and industrial sand and gravel extraction, and small-scale mining permits.

With some exceptions, decentralized Small Scale Mining Offices undertake most ASM-related regulation and monitoring functions in addition to technical assistance. The Natural Resources Development Corporation is responsible for management of rushes while the demarcation and designation of ASM zones is undertaken at a provincial level by multi-stakeholder Mining Regulatory Boards (Bugnosen, 2004). The Boards are further charged with the management and regulation of these areas, including resolution of conflicts.

Bugnosen, (2004) contends that a number of legislative measures have failed, while others have succeeded. Failures include:

- Designation of ASM areas;
- Permitting activities (e.g. gold panning permits) within existing concessions;
- Overly restrictive provisions for obtaining permits; and
- The need for multiple permits depending on the stage of operations (mining, permitting and marketing).

Successes have been observed in terms of gold rush control measures that have enabled tax collection and environmental protection in these areas and efforts to inhibit damaging sand and gravel operations (Bugnosen, 2004). The emergence of “contract mining” wherein formal companies purchase minerals from ASM producers, has been deemed promising, although local indigenous communities have expressed concern over its capacity to stimulate uncontrolled activities (Bugnosen, 2004, Caballero, 2004).

The development and implementation of appropriate legal frameworks are somewhat context specific; however, many key objectives cross borders, cultures and commodities. These include: legal provisions for efficient licensing, management and monitoring of ASM; policies which create incentives for legalization; transparent access to land titles; collection and equitable distribution of reasonable ASM rents; and realistic environmental management criteria. Despite this, talk without action – or policy without practice - produces few results. Successful legalization of the sector must be coupled with intensive and unrelenting efforts to formalize and regularize the sector.

8.2 Formalization

Formalization of ASM is a long process that is initiated by appropriate legislation and achieved through ongoing provision of extension services, incentives and other support to miners. As most ASM activities take place in remote regions, one of the key components of many formalization strategies have included decentralization of extension services, including licensing and registration, as well as training in mining techniques, environmental protection, occupational health and safety, and basic financial management. Working directly within mining areas further enables mining authorities to develop relationships with local miners and their communities, and provides a mechanism by which collaborations with local and regional rural development programmes can form.

Efforts in Ghana, Madagascar and Namibia provide considerable insight into the immense commitment and, in some cases, creativity needed to formalize ASM.

Case Study: Ghana

The regularization process in Ghana was a major theme of the 2003 CASM AGM in Elmina, Ghana. In 1989, when a Small Scale Mining Implementation Committee was formed to oversee "The Regularisation of Small Scale Gold and Diamond Mining Project", formalization efforts commenced with the demarcation of eight small-scale mining districts (Yakubu, 2003). Shortly thereafter, the provision of extension services to these districts was supplemented by the hiring of district officers and mines wardens, who were charged with carrying out the Small Scale Gold Mining Law (PNDC Law 218). Training of these officers in the mining law, health and safety issues in ASM, geology, preceded field activities. Since 1989, a number of additional ASM-specific training "Training of Trainers" courses have been provided to the officers, including environmental management, health and safety, basic bookkeeping and project planning and management (Yakubu, 2003).

In 1989, the daunting task of formalizing the gold miners was hindered by the fear of arrests by the government officials. However, this was slowly countered by efforts to fraternize with the miners on a social basis, which enabled them to gain their trust and communicate the benefits of legalization (Yakubu, 2003).

A number of schemes have since been attempted in an effort to create added incentive for formalization and means of support for Ghanaian miners. This includes the "Rent-A-Pump" Scheme in 1991, whereby ten 5 hp pumps were purchased and made available to miners for rental. The low capacity pumps unfortunately could not handle the influx at many sites and frequently broke down, causing miners to renege on their payments.

With facilitation by CEDECOM, an organization involved in providing assistance to small-scale fisherman and farmers, the "Hire-Purchase" Scheme (or rent-to-own) was subsequently attempted in 1993. Although miners reported some benefits, the lack of experience in mining and infrequent supervision by CEDECOM, combined with high inflation and inappropriate granting criteria (it was linked to miners capacity rather than the viability of the property), this project was deemed unsustainable.

In 1998, a technical assistance project pilot tested Brazilian hammer mills in the Bolgatanga region. As these mills proved to be effective, Chinese hammer mills have since been introduced and are now in widespread use.

A major Mining Sector Development and Environment Project saw the next important wave of regularization efforts through the generation of benefits to miners. This included pilot testing of hard rock and alluvial mining equipment, a programme to make geological information available to small-scale miners (resulting in a number of suitable demarcated areas), and reclamation of three degraded sites (Yakubu, 2003). Subsequent projects saw adaptation of the Mercury Law to enable miners to legally purchase small quantities of mercury for gold mining and training in the safe use of mercury.

Regularization efforts in Ghana have achieved notable progress. Over 620 mining licenses have been granted since efforts began and contribution to officially reported production has consequently risen from 2 to 7% for gold and 40 to 80% for diamonds between 1989 and 2002 (Aryee, 2003). In addition, the over 100,000 employed in the sector reportedly have access to increased alternative economic activities.

Despite the successes reported in Ghana, many problems persist. Local miners have complained of numerous barriers to registration and licensing, a process which can take up to six months. Once a site plan is submitted, it is posted for 21-days to ensure others do not have rights to the property. This is followed by a long application review process involving assessment by the district office, field inspections, subsequent review by the District Chief Executive, processing by the Minerals Commission in Accra, and application for an Environmental Permit with the Environmental Protection Agency (Azameti, 2003). If the applications are approved, an agreement is signed before the Operating Permit is granted, at which time the applicant must register with the Registrar of Land. In some instances, mining activities have been completed before the licence is granted and received.

As a consequence, many miners choose to work illegally. The Minerals Commission has reported additional challenges including the limited available land available for small-scale miners, legal limitations and ongoing environmental concerns (Aryee, 2003). The Ghanaian Minerals Commission seeks to resolve these issues by continuing with their efforts to educate miners, demarcate lands available to them, and promoting livelihood diversification. From more than 15 years of regularization experience in Ghana, it is clear that legalizing ASM is an ongoing process that requires persistence and dedication. It is unlikely that results will be immediate, but the lessons learned in the endeavour ultimately contribute to strategies for the way forward.

Case Study: Madagascar

With a population of 16 million, 50% of whom are less than 20 years old, and a per capita GDP of US\$ 250 per annum, poverty has driven many in Madagascar into ASM. The ASM operating climate in Madagascar has undergone tremendous changes since policy reforms in the late 1980s. Since 1988, official contribution of the mining sector to the GDP has risen from 3% to 5%, with more than US\$ 30 million worth of mineral commodities being exported in 2003 (Razafimandimby, 2004).

Revision of legal framework has included provisions to increase transparency, reduce illegal smuggling, and adding value to the gemstone industry. The enactment of a new Mining Code in 1999 has created a number of measures conducive to development of the large-scale sector. A series of licenses are now available including: a 3-month exclusive exploration permit, a 10-year exclusive exploration licence (renewable every 5 years), 40-year mining licenses (renewable every 20 years) (Razafimandimby, 2004). Establishment of a Mining Cadastre Office has supported transparent, first-come, first-served issuance of licenses via a computerized system which can be accessed from anywhere in the world.

With respect to formalization of ASM, most efforts have been directed towards gemstone mining. Ongoing and frequent rushes, an active domestic and foreign facilitated black market, and exports being primarily comprised of rough stones were key catalysts of government initiatives. Responses have included (*after* Razafimandimby, 2004):

- Empowerment of local communities and authorities to promote organization and manage mineral resources;
- Establishment of the Institute of Gemology of Madagascar;
- Installation of decentralized Mining Administration Offices in active ASM areas;
- Sensitization of local communities and authorities in laws and regulations, and the environmental and social effects of ASM;
- Support for gemstone marketing and training (by USAID); and
- Publication of ASM training booklets in Malagasey and French.

Case Study: Namibia

There are around 2,000 gemstone miners in Namibia, mining mainly diamonds, tourmaline, garnets and topaz. The government of Namibia has made a firm commitment to improving the sector with key activities including the simplification of access to mining titles, provision of technical and financial assistance to ASM projects, and monitoring environmental performance (Malango, 2002).

A major incentive for formalization and legalization of ASM includes access to financing. In the early 1990s, a central component of the Namibian strategy was provision of financial support for ASM activities. Funded through an EU Sysmin agreement, more than US\$ 3.1 million was provided for ten ASM projects, as well as a Small Miners Assistance Center (SMAC), created to provide training to the Small Miners Association of Namibia (SMAN) (Malango, 2004). Eight of the ten projects failed and the NSMAC collapsed due to organizational problems.

Since 1996, the training centre has been revitalized as the Namibian Small Miners Assistance Centre (NSMAC), which is now operated as a more structured organization. Outstanding Sysmin funds have been rolled into a revolving Minerals Development Fund (MDF) that has provided US\$ 92 million in loans and US\$ 9 million in grants. With assistance from NSMAC in the evaluation of ASM projects and the Directorate of Mines and Geological Survey in technical assessments, the fund is managed by a Board comprised of representatives from government institutions, Chamber of Mines, the small-

scale mining community and a local mining expert (Malango, 2004). Expenditures for the programme have totalled US\$ 104 million.

With low interest rates, an ample repayment period (5 years plus a 2 year grace period), sufficient management resources and minimal bureaucratic requirements, loan repayment has been remarkably successful (92%). Projects have targeted small, medium and large ventures, including shaft sinking, an exploration project, expansion of an open pit fluorspar mine, diamond recovery vessels, a garnet mine and two failed tourmaline projects (Malango, 2004).

Current challenges faced by the Namibian government include ensuring the sustainability of NSMAC, potentially through revenue-generating ASM projects, in order to continue with ASM assistance and training activities. Improvements in the gemstone market, through macroeconomic policy reforms (e.g. elimination of royalties in favour of export duties) and establishment of gemstone buying centers are also envisioned (Malango, 2004).

A wide range of approaches have been undertaken to promote formalization of ASM activities. Availing extension services to miners, often through decentralized units, provides an opportunity to improve ASM practices and increase the likelihood of legalization. In many cases, close collaboration with, and empowerment of, local and national stakeholders has been a key component of these efforts. As it is well demonstrated that programmes developed by the people participating in them (i.e. bottom-up measures) tend to be most effective and enduring, formalization efforts should, wherever possible, involve collaboration of ASM communities in their design and implementation (Veiga and Hinton, 2002). As it provides a mechanism by which to connect with ASM stakeholders, ASM organizations provides much-needed counterparts to government authorities throughout the formalization process and beyond.

8.3 Organization

The organization of illegal miners is widely recognized as an important precursor to providing the support needed to formalize and legalize activities as well as facilitate improvements in ASM communities. The criteria to access financing, technical support and legal tenure often presents a major challenge for many ASM operators, particularly given limitations related to language, literacy, transportation to government offices, and mistrust towards government agencies. Organization of activities presents an opportunity for miners to share the burdens of these challenges.

Most ASM operations are highly uncoordinated, with miners working essentially independently or in small partnerships. However, informal working agreements can also be found particularly when entrepreneurial operators have recognized the benefits of organization. In some cases, international charities and religious organizations have financially supported the development of ASM associations or cooperatives (Davidson, 1995). In other cases, false cooperatives have been formed to satisfy government authorities with ASM profits funnelled primarily to cooperative "heads" and

marginal incomes being paid to miners. Many ASM partnerships have therefore been somewhat superficial - developed to generate revenue rather than true collaborations on a technical or financial level - it is apparent that any organizations formed needs to be well structured, accompanied by technical or financial support, and be of obvious long-term benefit to participating miners.

ASM organizations can be found throughout the world. In Bolivia, more than 100 mining cooperatives serve more than 60,000 members including the 7,500 member strong Association of Women Miners (Bocangel, 2001). In Uganda, gold miners in one village in Bushenyi District have formed three separate associations in order to facilitate group savings schemes (Hinton, 2005). And in the Philippines, the Kias Explorers Association has enabled legalization of the Kias Mine and, through generation of member dues, has provided a means to pay milling fees (Bugnosen, 1998).

One example of a successful, community driven ASM organization is the formally registered Sanimuso Rural Gold Producers Cooperative in Guinea. Covering over 40 gold mining villages, the Sanimuso Cooperative boasts a membership of over 5000 miners (Barnes, 2003). More than 60 mine sites affiliated with Sanimuso are employing highly basic methods, mainly pans and calabashes, to produce between 3 and 75 grams of coarse gold per pit daily. Founded by four women and one man, all veteran gold miners, Sanimuso (which means "golden ladies"), is actively working to generate funds from the coop and external partners for inputs such as motor-pumps, jigs, Medicaid, social amenities such as schools, hospitals and markets, potable drinking water, and environmental and soil restoration programmes.

A primary concern of the Sanimuso Cooperative and its constituents relates to the consortium of gold buyers, the *Djati* ("men with the weighing scales"), who take advantage of miners lack of awareness of international market prices and tamper with scales (Barnes, 2003). This exploitation of miners, more than 70% of whom are women, has effectively reduced motivation to mine, despite the promising mineral potential in the region. By consolidating the gold produced by cooperative members (about 122 kg of 22 carat gold per month), Sanimuso hopes to attain a better gold price, with a portion of the revenues going directly to community development funds.

With requests by neighbouring ASM communities for inclusion in the cooperative, the growing Sanumiso Cooperative has ambitious and worthy aims for the Guinean sector. These include (*after* Barnes, 2003):

- Improved ASM technologies with related training;
- Increased incomes of the small-scale gold miner and corresponding contributions to the local economy;
- Collaboration with other ASM sites in the region;
- Environmental protection;
- Collaboration with international organizations, the mining industry, and other private and public entities; and
- Provision of viable business opportunities to small-scale miners such as the creation of a micro-finance institution.

The challenge for the Sanimuso Cooperative and many other ASM organizations continues to be the development of partnerships with other organizations, agencies and individuals who can – through funding and technical support – assist in the achievement of these laudable objectives. The grassroots capacity to drive positive change exists through Sanimuso and similar organizations throughout the world and external support would certainly aid in the cause. However, it is evident that in many cases, other mechanisms can also drive these improvements. As proposed by Sanimuso, the implementation of group savings schemes or creation of formal microfinance institutions (e.g. Miners’ Banks) could finance many of the proposed improvements. In addition to mining related entities, collaboration with non-traditional agencies and institutions, such as Health Ministries and health-based NGOs, could provide support for broader community-level improvements.

Strong private sector mining associations can play an important role in lobbying for improved buying and selling arrangements, monitoring unfair practices and effectively advocating for other needs of the ASM sector. These groups, including Chambers of Mines, can further provide a mechanism, by which certain services can be provided including (*after* Hentschel et al., 2001):

- Information on laws and regulations, market prices, current ASM initiatives, and channels to access other support;
- Lobbying for the interests of its members through policy reform;
- Provide organization and formalization assistance to miners; and
- Improve the image of the ASM sector.

It is important to note that the formation of associations, cooperatives, enterprises and other groups are not socio-culturally or individually appropriate in all contexts. Many miners prefer to work independently and are unlikely to participate in formal or informal groups. Thus, formalization and legalization efforts must also not exclude these individual entrepreneurs. Realistically, however, many government authorities and agencies lack the resources to provide support on an individual basis – consequently, the support received by the individual miner often relies almost solely on his or her own initiative.

8.4 The Role of Large Scale Mining

Formal mining companies clearly have an important role to play in the advancement of the ASM sector. Mining companies are as heterogeneous as artisanal and small-scale miners; thus, the nature of the relationship between these parties varies from company-to-company and site-to-site. Four main types of relationships, or combinations thereof, are generally observed:

1. *Mutually Beneficial*

Progressive mining companies recognize both the socio-political risks of ASM and the benefits of contributing to improvements in the sector. With increased commitment to corporate social responsibility, efforts to contribute to sustainability in the communities surrounding large mines, which in many cases include artisanal and small-scale miners, have become a core component of mine development. Support for ASM through measures such as technology

assistance, demarcation of small zones within mining leases or support for alternative livelihoods may both add value and reduce risks of conflict and liability for poor ASM practices (Box 4). These companies further acknowledge that many elements of society, including potential shareholders, perceive mining to be homogeneous, with the negative impacts of ASM being representative of all mining practice; thus, efforts to improve the performance of ASM is in the interests of the whole mining industry.

Certain mutually beneficial arrangements have involved “contract mining”, wherein formal companies purchase minerals from ASM producers. In the Philippines, Benguet Corporation has allowed small-scale gold miners to legally mine on the company’s property in exchange for exclusive rights to purchase the tailings from gravity concentration (Bugnosen, 2001). Throughout Uganda, as much as 20% of the ‘production’ of several large-scale industrial mineral companies is purchased directly from both legal and illegal artisanal and small-scale miners (Hinton, 2005). In Northern Tanzania, one formal, medium-sized mining company allowed illegal ASM on their property as these activities preceded the formal claim and were reasonably localized and small in scale (Anon, 2005). In this case, the company built a school and facilitated construction of a health clinic. In situations where companies allow or enable illegal mining, concerns over liability issues creates a solid case for support for legalization and improved practices.

2. Exploitative

In some countries, a significant proportion of artisanally mined materials are sold to formal operations for subsequent processing. As this arrangement provides a steady cash flow to the miners, many accept purchase prices well below fair market value in order to sustain themselves. In many cases, miners are unaware of the international market value, thereby limiting their power to negotiate a decent price.

In other cases, formal producers provide employment to artisans, which may be as equally tenuous as that in the informal sector. Pervasive “hire-fire” policies and the failure of many artisans to work on a reliable basis often inhibit development of more formalized working arrangements (Mukundane, 2005). Frequently, registered owners hire marginally skilled locals who employ crude methods often without provision of safety gear. In many instances, licence holders “employ” artisans on a per volume basis, an arrangement which generally facilitates ongoing employment of miners as a trade-off for exploitative purchase prices.

Artisanal and small-scale miners have also been known to exploit well-meaning formal companies. Invasions of property in search of compensation are frequently reported. Entrepreneurial small-scale miners have been known to stake claims around exploration drill rigs as they move across properties. In Bolivia, joint ventures between junior mining companies and ASM cooperatives led to a cessation of work by miners with the expectation of payment (Hentschel et al., 2005). Many companies, particularly those small and medium in size, lack the resources, capacity or understanding to respond to these situations effectively.

3. *Unwilling Tolerance*

In some cases, employment or purchasing arrangements between formal companies and artisanal and small-scale miners are viewed as being exploitative, but have evolved as a reactive measure to appease local or encroaching miners. Although this is sometimes a reasonable solution, many miners may feel cheated, increasing tensions and the potential for conflict (Hentschel et al., 2001). In other cases, despite liability concerns, formal companies allow ASM to continue on their concessions with little interaction with these miners in the hopes of avoiding conflict.

4. *High Risk*

In some cases, the relationship between formal and informal producers is marred by disagreements over land use, usually in association with involuntary halting of illegal activities and displacement of miners and their families. Despite discovering many deposits, artisanal and small-scale miners may resent the lack of compensation typically received for this and are further threatened by the loss of their livelihoods. Encroachment of miners onto large-scale mine sites, particularly as a rush, can be especially precarious. In this case, the risks of accidents, for instance in association with rock falls and shaft collapses, can be high, particularly when miners invade properties at night.

Throughout the world, unresolved conflicts with local communities have rapidly escalated, in some cases resulting in violence and intimidation. For example, in response to the eviction of illegal miners from property controlled by the Brazilian company CVRD, displaced miners took seven company employees hostage until their demands were met. Conflicts are costly, not only in terms of the human security risks, but in association with the financial costs of litigation or stalling and, in some cases, halting formal mining activities.

The business case for enhanced support for ASM is strong. Large-scale mining companies increasingly recognize that sustainability will only be realized once win-win solutions to development challenges - including the prevention and mitigation of conflict - are identified. There are a ways that companies can support the ASM sector leading to mutually beneficial relationships. Many of these are closely aligned with efforts to organize, formalize and legalize ASM, including the following (*after* Hentschel et al., 2001; UNECA, 2002):

- Demarcation of small zones inappropriate for large-scale extraction on mining leases (in conjunction with regulatory authorities);
- Provision of financing (i.e. loans) for technical and other improvements;
- Assistance or training in a range of issues (e.g. occupational health, reclamation, mining methods; financial management);
- Assistance in the management of explosives;
- Emergency response;
- Provision of processing services;
- Liaising with government departments, NGOs and international agencies in efforts to obtain additional support;
- Guidance on marketing and commercialization;
- Support for alternative livelihood development; and
- Assistance in organization, formalization and legalization.

Box Four: Best Practices - Mining Companies and ASM

A growing number of formal mining companies are fostering positive relationships with ASM communities. These types of partnerships should be actively promoted but it is important that large companies are well prepared to understand the complexity of the ASM world. A few remarkable examples include the following:

Kelian Mine, Indonesia

At the large-scale Kelian Mine in East Kalimantan, Indonesia, mining activities ceased in 2004 after 13 years in operation (Crispin, 2003). With an active ASM community of 2000-4000 miners working downstream from the mine site, Kelian has incorporated the impacts of closure on the ASM community. The majority (75%) of miners are members of the Bugis ethnic group who have migrated to the region and hold no ownership of land. ASM operations have been employing environmentally destructive techniques to extract between 1-2 grams of gold daily via panning and 20-100 grams per day using a two-pump system and sluices (Crispin, 2003). Local Dyak miners mine only on a seasonal basis and are concerned about engaging in “offensive” behaviour. Concerned about the social and environmental consequences of closure, Kelian has instituted a number of programmes, including:

- A community verification process to ensure that miners are aware of the absence of alluvial gold in the wetland treatment site;
- Wetland filter to remove metals from effluent;
- Formation of an advisory group to monitor and protect the integrity of a tailings dam, including extraction of remaining gold by ASM and community verification of its removal;
- A community awareness programme covering a range of issues, including occupational health and safety and the use of mercury in ASM; and
- Community-based management of future ASM activities.

Sadiola Gold Project, Mali

The disruption caused by ASM activities and relocation of two villages prompted AngloGold, through development of the Sadiola Gold Mining Project, to implement a broad community support programme (Keita, 2001). This project provided technical assistance, established a community development fund and supported alternative revenue generating activities, such as agriculture, jewellery production and fabrication of dyes and soaps. A water dam, rural school, adult learning centre, health centre and communal market were also constructed (Keita, 2001).

Las Cristinas, Venezuela

One of the best-documented examples of coexistence between company and artisanal miners is Placer Dome's Las Cristinas Project in Venezuela. Movement of miners to concessions held by transnational mining company MINCA (majority owned by Placer Dome Inc.) stimulated support for a technically-assisted partnership with local miners, including development of a semi-mechanized, environmentally sound ASM operation (Davidson, 1993). The company recognized the socio-economic importance of the miners and created a mechanism to help them organize and access better technology. Since Placer Dome sold its shares in Las Cristinas in 2002, support for ASM has dissipated. However, MINCA has entered into partnership with local communities, a mining association, government agencies and the Humanitarian Medical Relief Foundation, resulting in the construction of a community health centre (Delfino, 2001). Primary benefits include (BPD, 2005):

- Improved access to health care for 12,000 people;
- Improved communication channels between the local communities and government;
- Reduced tensions between the Creole and indigenous communities;
- A new, formally registered regional community institution;

The center continues to function managed jointly by the state and the community with support from the Merunto Foundation, a community based organization involved in the development and promotion of a range of community development initiatives.

These examples demonstrate that, not only can large-scale miners co-exist with artisanal and small-scale miners, but they can make a significant contribution to the wellbeing of both miners and the surrounding community.

9 BUILDING SUSTAINABLE LIVELIHOODS

Advancing ASM and its contribution to the reduction of poverty requires holistic understanding of the complex challenges facing the sector and explicit consideration of the strengths and opportunities inherent in ASM communities.

A number of initiatives and programmes are actively seeking to build sustainable livelihoods in ASM communities. These endeavours focus on:

- Technical assistance;
- Community development and poverty reduction;
- Conflict resolution;
- Microcredit and financing;
- Fair trade initiatives; and the
- Empowerment of women.

Collectively, these approaches strive to proactively respond to the needs of miners and communities and break the barriers to positive change while contributing to higher level policy objectives. These efforts generally echo the need for progress towards achievement of the Millennium Development Goals (MDGs) and national poverty reduction strategies; however, it is rare that the commitments put forth by such initiatives are explicitly incorporated into theory or practice. Nevertheless, there is much to be learned from these ambitious and worthy undertakings – they provide the international ASM community with an invaluable foundation for current and future endeavours seeking to transform the vision of sustainable livelihoods into a reality.

The prospective contribution of ASM to the development of sustainable livelihoods is significant, yet realization of this potential is marred by low levels of awareness in the international community and correspondingly marginal support. As demonstrated at the 2005 CASM-sponsored event the “Millennium Development Goals and Small-Scale Mining: A Conference for Forging Partnerships for Action”, ASM priorities closely parallel the development objectives of donors, governments, communities, NGOs, academia and other agencies and institutions. Raising awareness within these key organizations currently outside the ASM dialogue and forging partnerships to achieve these mutual objectives will serve both the advancement of ASM, the development of sustainable rural livelihoods and broader poverty reduction.

9.1 Technical Assistance

Inefficient, environmentally destructive and occupationally hazardous mining methods play a pivotal role in the ASM poverty cycle. Largely due to lack of knowledge, limited access to technology alternatives, and inadequate financial resources, most miners achieve little success in improving their mining practices. Past technical assistance projects have performed only marginally better, although a number of important achievements have been reported. In all sectors, technology assistance programmes have gone through a transition from the transfer of modern, science based technologies to approaches which build upon the traditional technologies and knowledge that has evolved within

communities. The ASM sector is also learning this lesson. Ultimately, a technology development programme is more likely to be sustained if built upon people's strengths, inherent skills and knowledge.

At the 2003 CASM AGM, Hermann Wotruba put forth a number of guiding principles for technical assistance. Based upon decades of experience in the ASM sector, Wotruba (2003) recommends the following:

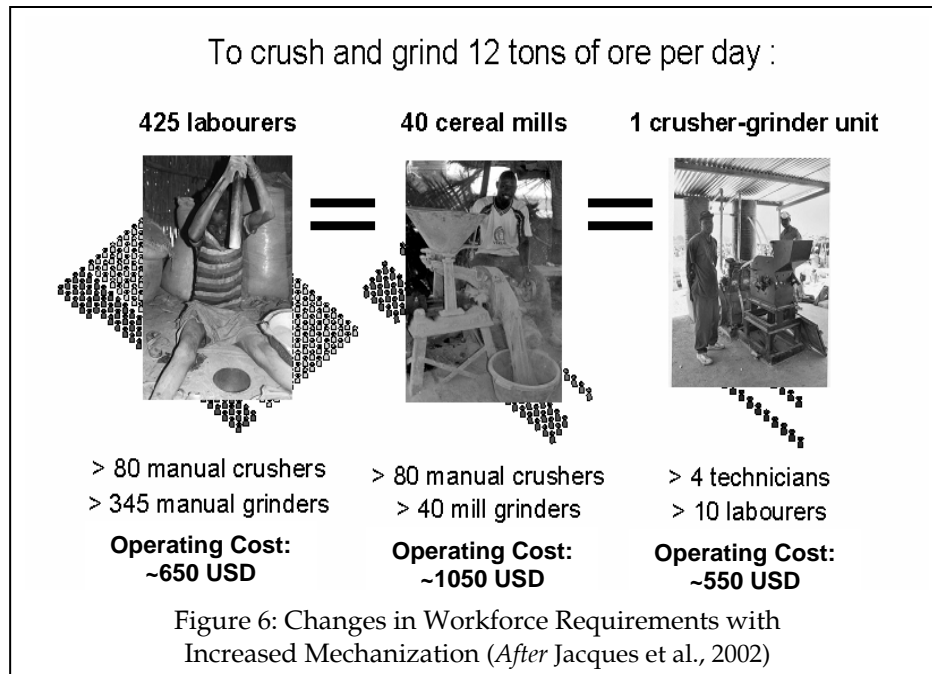
- Technical and environmental measures should be adapted and tested in conjunction with the miners, ideally in a step-wise manner;
- The knowledge of the miners should be valued and respected throughout the assistance process;
- Most people overestimate their capacity to handle complex equipment. However, experience has shown that success is more likely when proposed technologies are inexpensive, simple and easy to operate and maintain. This also increases the probability that technology will be disseminated and replicated elsewhere;
- The current practices and capacity of the miners should provide a baseline for introduced technological changes (i.e. an immediate transition from panning to jigs may be too drastic a change; a well designed sluice may be a more effective alternative);
- It is often easier and more effective to improve upon processes currently in use than to introduce new ones;
- A new technology should lead to both economic *and* environmental improvements;
- The potential obstacles to change should be assessed. These may include: the nature and level of work organization (e.g. relationship between miners, processors, operators, buyers, etc); religious or cultural values; political agendas of local leaders; etc.
- Working with a large number of disorganized individuals is far more complicated than working with formalized organizations with a clear structure and roles and responsibilities assigned to key persons. Organization of miners into clearly structured groups with well defined roles and responsibilities is a key first step¹⁸;
- Self-sufficiency of the miners should be a primary goal of assistance efforts;
- Any major decisions concerning technology assistance should be undertaken in consultation with all affected miners. Formal or informal local leaders do not always represent their constituencies;
- Consider a range of means for communication with miners (e.g. general assemblies, one-on-one discussions, small groups); and
- Formal, written documentation should be maintained between the assistance project and miners in order to clarify the responsibilities of all parties involved and ensure agreement on key decisions;
- Formation of a working group, including miners, technical experts, social scientists and others *as a first step* can assist considerably throughout the process; and
- The introduction of technology improvements should be supplemented by sensitization, education and training of miners and long-term follow-up.

¹⁸ Wotruba (2003) contends that small enterprises are easier to work with and may be more sustainable than cooperatives, which require democratic processes that can impede decision-making.

It is important to note that the technical support and training requirements of artisanal or “subsistence” miners will differ somewhat from those needed by more mechanized and/or more skilled and entrepreneurial small-scale miners, particularly with respect to the nature of technology promoted, and how this support is delivered.

Unlike most mechanized operations, the productivity of most highly manual and labour intensive ASM operations is strongly reliant on the number of miners involved. As most technical improvements will inevitably lead to reductions in the artisanal workforce, it is important that any technical assistance be undertaken gradually and, ideally, with concurrent support for alternative livelihoods (Jacques et al., 2002). This should be an important consideration of any technical assistance efforts targeting artisanal miners. The reduced labour requirement with increasing mechanization is exemplified in Figure 6. “Intermediate technologies”, i.e. those which improve productivity with relatively low investment costs, are a means to make a step-wise transition in technologies (Wotruba, 2003)

Current approaches employed in technical assistance projects recognize the diversity of the ASM sector, both within and between mine sites, and the multitude of factors – technical, social, economic, environmental, political and cultural – impacting project outcomes. Examples from the six-country Global Mercury Project, the Support Project for the Artisanal Diamond Sector (PASAD) in the Central African Republic and a programme jointly supported by ILO, Cooperacion and CASM in Santa Filomena in Peru provide considerable insight.



Case Study: The Global Mercury Project

One of the largest technical assistance projects currently underway, the Global Mercury Project (GMP) is seeking to reduce mercury emissions from artisanal

and small-scale gold mining. With a primary goal of introducing cleaner ASM technologies, project sites in six participating countries (Zimbabwe, Tanzania, Sudan, Brazil, Indonesia and Lao PDR) were selected based on the importance of ASM in these regions and their proximity to international waters susceptible to mercury pollution. At the 2003 CASM AGM in Ghana, UNIDO consultant Marcello Veiga described the issues in GMP-target communities and the broad-based approach being employed through the project.

With an estimated 50% of the world's artisanal and small-scale miners involved in gold mining and the numbers rising with increasing gold prices, the environmental and human health impacts of mercury misuse continue to be an ongoing concern (Veiga and Bernaudat, 2003). Current gold mining activities are releasing between 800 and 1000 tonnes of mercury annually into the environment with affects to ecosystem health being felt both locally and globally (Veiga and Baker, 2004). Much of the misuse is attributed to poor mining methods and limited awareness; however, the linkages to broader socio-economic and legal conditions are also critical factors. Ironically, most mercury used by artisanal gold miners originates in Europe, North America and other countries that are reselling mercury recycled from environmental upgrades of older technologies (Veiga and Bernaudat, 2003).

Mining methods currently used in GMP sites range from hydraulic monitors, as in Crepurizinho and Saõ Chico in Brazil and Galangan in Indonesia, to 'hard rock' mining, as in Kadoma-Chakari, Zimbabwe and Rwamagasa, Tanzania, where highly manual ore extraction (e.g. picks, shovels, hammers and chisels) generates shafts as deep as 100m (Hinton and Veiga, 2004). In the latter cases, ore is sent to nearby, independently-operated stamp or ball mills for crushing and amalgamation on copper plates, sluices or directly in the mill. Amalgam decomposition (burning) is, in all cases, undertaken without the use of retorts. Mercury is generally emitted to the atmosphere through burning and discharged with tailings. With vast differences between GMP communities in terms of technologies, numbers involved, and productivity, mercury consumption ranges widely from 1-2 kg per annum in Lao PDR to 20-30 tonnes per annum in Talawaan, Indonesia (Hinton and Veiga, 2004).

The GMP has proposed transportable demonstration units (TDUs) to reach miners in GMP-target communities. By using TDUs, a variety of technical options for grinding, gold concentration, amalgamation and retorting can be demonstrated to miners and millers. Local manufacturers will be involved in the production of equipment, with a ceiling on equipment prices of US \$5,000. With the project linking miners to local financing sources, miners will be free to select from the TDU what is affordable, durable and appropriate according to their needs and resources (Metcalf, 2005). The units are flexible in terms of the technologies to be demonstrated and they provide an opportunity to include "peripheral" education, for instance related to health and sanitation, book-keeping, and legal issues. Partnerships with local health care providers and NGOs will assist in these efforts. Locally appropriate training modules are being developed for each of the GMP-target communities and creative tools are being explored, including theatrical productions, short films and recruitment of national sports icons (e.g. footballers) to encourage participation (Metcalf, 2005).

Although cleaner technologies and reduced mercury pollution are key objectives, the GMP also recognizes that a holistic approach is critical to facilitating change in the ASM sector. By training miners, not only in mining methods but in occupational safety, environmental and community health, and management methods, the GMP seeks to benefit not only miners, but the broader community (Veiga and Bernaudat, 2003). Additional components address the development of appropriate regulatory mechanisms, strengthening governance, and building the capacity of local laboratories and health authorities to monitor mercury pollution. The GMP is jointly supported by the Global Environment Facility (GEF), United Nations Development Programme (UNDP) and is executed by United Nations Industrial Development Organization (UNIDO).



Photo 15: Sudanese Gold Miners at a GMP Awareness-Building Session
(Photo by UNIDO)

It is clear that mitigating the misuse of mercury in ASM requires an integrated approach that targets the technical as well as the socio-economic and political dimensions of ASM. The GMP recognizes the complexity of these issues and provides an excellent model of how these challenges can be tackled. However, the regions benefiting from the GMP constitute only a fraction of the global population impacted by these activities. It is evident that a coordinated global effort is critically needed to address the challenges facing the artisanal and small-scale gold mining sector. According to Dr. Veiga, we need to “think globally and act locally” to bring about positive changes (Veiga and Bernaudat, 2003). From community-level initiatives, such as the introduction of cleaner technologies and sensitization in community health issues, to broader policy-related measures, particularly related to the international mercury trade, significant advances can be made, not only in reducing mercury emissions from gold mining, but in ASM communities in general.

Case Study: Support Project for the Artisanal Diamond Sector in CAR

In the Central African Republic (CAR), diamonds are the main mineral resource. The majority of diamonds are high in quality, with 70% produced being gem quality and the per carat value averaging US\$ 150, diamonds contribute 4% of the GDP of CAR (Pelon, 2004). In 1994, diamond mining provided a direct livelihood to 80,000 to 100,000 miners, 4,000 of which are licensed, and indirectly supported an additional 300,000 Central African Republicans. The composition of the sector and benefits to these actors are as follows (*after* Pelon, 2004):

- 41% of the income goes to about 80,000 mine operators (average income US\$ 280/mo) and diggers (average US\$ 50/mo). The diamond selling price averages 30,000 CFA/ct;
- 28% of the income goes to collectors/buyers who sell the diamonds at a price averaging 70,000 CFA/ct;
- 10% is directed to five purchasing offices that facilitate export. The diamond selling price averages 90,000 CFA/ct on the world market; and
- 21% goes to the state.

Most diamond mining in CAR employs crude and inefficient technologies. Women and temporary male labourers undertake the bulk of digging and hauling, who receive the least compensation for their labours. With depletion of easily extractable alluvial deposits, main technical issues include limited technical skills, particularly with respect to extraction of primary diamond deposits, and delineation of mineral resources in order to sustain and further develop the sector (Pelon, 2004). Other factors constraining the sector include an inadequate legal framework, significant social and human health impacts and the high-risks associated with investment.

The Support Project for the Artisanal Diamond Sector (PASAD) was instituted by BGRM (Bureau of Geological and Mineral Research) from 1996 to 1998. Working in conjunction with miners and government authorities, BRGM undertook a programme to understand the geologic potential, identify suitable sites for organized ASM activities and explore improved technical methods (Pelon, 2004). Training of miners was further provided by six mining technicians. Promotion of PASAD was undertaken through a communication strategy involving meetings and seminars with various stakeholders, radio campaigns and development of collaborations with the health and finance sectors (Pelon, 2004).

This broad-based approach to ASM assistance project achieved a number of successes. Local training efforts and technical support has yielded positive results and the communication campaign was deemed an effective means of disseminating information. Certain challenges still persist. Specifically, the lack of financing for miners continues to be problematic. Amelioration may be provided through a combination of alternatives, such as microcredit schemes, establishment of credible company to deliver ASM services; successful attraction of investors to the country, and improved relations between the financial sector and ASM (Pelon, 2004).

Case Study: Santa Filomena, Peru

Santa Filomena is a remote, poorly-serviced gold mining community in southern Peru. Initially populated in the 1980s by unemployed migrant workers and their families, a community was constructed around the headframe of the mine (CASM, 2002). Currently, dispersed amongst the simple reed structures housing about 450 families, are small shops and mineral processing sites. Using “quimbaletes” crushers, a 2,000 year old technology comprised of a large grinding stone, mercury is amalgamated with gold in the crushed ore. In Sur-Medio and Puno in Peru, where mercury is added directly to quimbaletes during crushing, mercury concentrations in tailings have been measured as high as 1.5 kg_{mercury}/tonne_{tailings} and average 0.5 kg_{mercury}/tonne_{tailings} (Hruschka, 2002). More than 40% of the 1,500 residents are comprised of children and child labour has been widespread. This is attributed to the belief that work prepares children for the labour force and that leisure time should be used for work, coupled with high levels of poverty and a lack of information on the consequences of child labour (Romero, 2003). Prior to any technical assistance efforts, the local community was found to be highly organized and actively seeking to licence their activities.

A joint programme has been undertaken in Santa Filomena to reduce child labour using an integrated approach that links technical assistance with income generation, improved services, and capacity and awareness building, particularly with respect to child labour (Romero, 2003). Major technical enhancements include installation of an electric winch, technical assessments of the resource potential, construction of a centralized, cooperative-operated cyanidation plant and elaboration of a CASM-sponsored environmental management plan.

A Peruvian NGO, Cooperaccion, has provided considerable organizational support to many aspects of the assistance project. With on-the-ground efforts by Cooperaccion, combined with support from the International Labor Organization (ILO), who has established Santa Filomena as a pilot community for the eradication of child labor in artisanal mining, the project has realized a number of achievements including (Romero, 2003):

- Reduction in the use of mercury;
- More efficient and productive gold extraction;
- Improved worker safety;
- Decreased involvement of child labour in mining;
- Increased household incomes; and
- Organization and formalization of ASM activities.

Local residents have demonstrated remarkable initiative and resilience, factors that have significantly contributed to their accomplishments. The challenge remains, however, to convince Santa Filomenans that they have the capacity to be self-reliant, not only with respect to local management of the plant, but the development of the community (Romero, 2003). The international ASM community is anticipating that Santa Filomena will become an important example for other marginalized ASM communities throughout the world.

9.2 Community Development and Poverty Reduction

The reduction of poverty through community development has become one of the main objectives of ASM interventions. Baffour (2003) contends there are three primary dimensions of poverty: (i) the income or consumption dimension, which refers to lack of assets and income; (ii) the social services dimension, which includes lack of access to basic infrastructure and services, such as health care and education, adequate living conditions and freedom from crime and violence; and (iii) a participatory dimension, which encapsulates lack of autonomy, political voice and dignity. The complex nature of poverty itself necessitates equally multi-faceted approaches to its reduction. Tools such as the Guidelines for Profiling ASM in Africa (described in Chapter 10), provide guidance as to how diverse sustainable livelihood opportunities can be understood and poverty reduction advanced.

Through direct support and promotion at Learning Events, CASM encourages the development of projects and approaches by individuals, communities and institutions that will directly or indirectly contribute to the reduction of poverty and the advancement of strong, resilient communities in regions where ASM represents an important activity. A number of related interventions have been profiled at CASM events, including somewhat different but complementary approaches employed by the World Bank and UK Department for International Development in Burkina Faso, Ghana, Tanzania and Zambia.

These interventions signify immense progress towards the development of ASM communities. Advancement, however, is still needed in terms of explicit inclusion of ASM within integrated rural development strategies. Although rural development has traditionally been associated with agriculture, current practice recognizes that sustainable development hinges on *integrated* rural development, which necessitates identifying and building on traditional networks and institutions related to agriculture *and* other sectors. Integrated rural development builds on the concept that business, agricultural, non-agricultural, environmental and social development opportunities are harnessed around land as a core resource. Cultivation of economic and social bridges between these activities – whether they are complementary or not – has remarkable potential to stimulate economic diversification and rural development. Poverty reduction requires the development of strong partnerships for development. In order to advance inclusion of ASM within integrated rural development, adequate resources are needed to strengthen relationships and solidify partnerships with other sectors and build the capacity of ASM stakeholders to effectively participate in multi-sectoral development initiatives.

Case Study: Gold Mining in Burkina Faso

Comprehensive and versatile assistance projects are increasingly becoming the norm. A World Bank funded intervention currently underway in Burkina Faso has coupled technical assistance efforts with broader community development objectives with noteworthy improvements observed thus far. With more than 200 active sites in Burkina Faso, more than 100,000 artisanal or small-scale miners are actively conducting surface and underground mining, mainly using very rudimentary techniques (e.g. manual rock breaking, hauling with a sack

and rope, transport via donkey or on foot) (Bayah, 2003). Living conditions are pervasively unhygienic and the presence of children is ubiquitous. Despite the appalling conditions, people continue to live day-to-day, driven by the need for sustenance rather than sustainability (Bayah, 2003).

Founded in the view that ASM can be transformed into a valuable tool for the reduction of rural poverty, the project has been designed such that it builds on the current reality in ASM communities. In order to understand this reality, a detailed examination of the multiple and often overlapping policy and mandates of institutions in Burkina Faso has been conducted in order to centralize the monitoring and support for ASM communities. Often those charged with assisting ASM have inadequate understanding of the sector, providing inappropriate advice and thereby exacerbating the problems they are hoping to solve (Bayah et al., 2003). Sensitization and training of these entities was identified as a critical need to improve ASM in the country.

An exhaustive study of the socio-economic, health, environmental and technical issues in the ASM sector in Burkina Faso yielded a number of insights that ultimately guided project design. Of particular note: a major gap exists between institutions and ASM operators; ASM is producing high revenues, but the benefits at a community-level have been marginal with the high mobility of miners generating a host of social impacts, including alcoholism, drug abuse, prostitution and banditry; site activities are largely informal, relying on one-on-one relationships rather than structured organizations; community health conditions are abysmal, with poor housing conditions and hygiene, malnutrition, and limited awareness of HIV/AIDS; environmental management is poor resulting in widespread degradation; occupational health and safety practices are poor; and mining methods are highly basic and inefficient.

With a solid understanding of local issues and key connections made with communities, educational and sensitization campaigns were designed to address the issues identified through the evaluation process. This was undertaken using local theatrical groups who acted out sketches in local languages and French, films on worker safety and HIV/AIDS, and local TV programmes, including a documentary (Bayah, 2003). The programme was implemented at 12 different sites, attracting between 1,000 and 2,500 people per show. The high turnout, coupled with direct participation of local miners and other community members in theatrical performances, was an important catalyst for locally-driven changes. Key outcomes include the following (Bayah et al., 2003):

- Medical outposts reported increased condom requests and consultations concerning HIV/AIDS;
- Increased interest in the formation of cooperatives by ASM operators;
- The supply and enforced use of dust masks at one site; and
- A desire by miners to be seen as contributors to national economies rather than environmentally and socially destructive forces.

As technology is generally at the forefront of miners concerns and is so strongly linked with many negative community-level outcomes, GEOMAN Consult, through the World Bank funded project, has actively encouraged the

local fabrication and use of a range of gold mining equipment, including crushers, hammer mills and small trommels (Bayah et al., 2003). Site visits and technology demonstrations coupled with health and safety training have, thus far, yielded impressive results (Table 6).

Table 6: Results from Technology Demonstrations, Burkina Faso
(After Bayah, 2003)

Description	Original Set-up	New Set-up
Number of Days Tested	1	1
Tonnage Treated	0.5	3.5
Average Treatment Costs (USD per tonne)	175	55
Break Even Grade (grams per tonne) [Using USD 340 per ounce]	16	5
Gold Recovery	35 – 45%	70 – 75%

Although this equipment is increasingly available in Burkina Faso, artisanal and small-scale miners frequently lack the financing to access it. Thus, the project undertook a survey of local financing mechanisms that could be suitable for ASM. Study findings were presented to miners, financing institutions and other stakeholders through a series of workshops. This effort identified several financial institutions interested to assist the sector, including CDE, who has since conducted detailed evaluations at twelve mine sites and approved seven for financing (Bayah et al., 2003).

Other aspects of the project more directly relate to broader community needs. These include the provision of water through borehole development at mine sites, which has enhanced the lives of women responsible for carrying water and enabled the development of vegetable growing projects through irrigation. Hygiene facilities have also been installed at a number of sites to counter related community health risks. Women are further being trained to manage mineral processing activities at mineral processing centres and women's groups and community associations in Alga are now managing a childcare facility that keep children away from mining activities. The cooperative is contributing about 60,000 fCFA (US \$100) monthly to the project, with proceeds funding the feeding and supervision of children (Bayah et al., 2003).

With expertise ranging from geology and mineral processing to community health and agriculture, the diversely skilled project team has demonstrated that holistic approaches are critical to positive change in the ASM sector. Strong collaborations with miners and other stakeholders and high value placed on the skills and knowledge of ASM communities have been vital elements throughout the project. By continuing to explore alternative livelihoods through linkages with agriculture and other sectors, the project hopes to make an even bigger contribution to broader development objectives in the future.

Case Study: Ghana, Zambia and Tanzania

A number of interventions have been implemented in ASM communities throughout the world. According to Kevin D'Souza of Wardell Armstrong, however, the lasting impacts of these costly efforts presents a major cause for concern (D'Souza, 2003b). A major challenge to lasting benefits relates to the

contradiction between sustenance and sustainability. Many miners live in abject poverty and work to survive on a day-to-day basis; however, most interventions require a colossal shift to long-term planning in order to achieve their objectives.

D'Souza (2003b) contends that an "integrated policy and practice model" must be tested and adapted at the country level in order to achieve sustained benefits. An integrated policy framework would tackle all of the major issues facing the ASM sector with efforts including the following (D'Souza, 2003b):

- Development of an enabling and appropriate legislative framework;
- Creation of an independent licensing registry office to ensure transparent and non-discriminatory practices with granting of concessions based on a first come, first served basis. Licensing would provide full, transferable and secure mining titles;
- Delineation and definition of the mineral potential suitable for ASM exploitation;
- Removal of gender-based constraints from legislation;
- Establishment of a Government institution or unit to handle and/or manage the ASM sector;
- Encouragement for the formation of ASM associations or co-operatives, including women's associations;
- Provision of decentralized extension services - including technical assistance and training schemes (appropriate technology, health and safety, etc);
- Provision of a viable and sustainable financing scheme for the ASM sector;
- Development of a fair and effective marketing system for ASM products;
- Defining relevant and consistent health & safety standards and practices; and
- Establish appropriate and realistic environmental protection practices and principles;
- Incorporation of ASM into national environmental protection programmes; and
- Formal inclusion of ASM in national mineral development policies and, correspondingly, incorporation of ASM into country Poverty Reduction Strategy Papers (PRSPs) in order to access HIPC and donor funds.

DFID is exploring these and other specific issues through a series of projects in Ghana, Tanzania and Zambia related to livelihoods, policy frameworks and vulnerability to commodity prices. Initiated in 2003, the project team includes local and international consultants and partnerships with government, NGOs, academia, ASM associations and mining companies (D'Souza, 2003b).

The comprehensive livelihoods study seeks to fully understand the issues and opportunities in ASM communities in order to develop policy responses that

are appropriate, effective and can improve wellbeing in ASM communities. The work intends to answer the following questions (D'Souza, 2003b):

- What is the importance/significance of the ASM sector in the wider economy?
- What have been the underlying factors and trends affecting livelihoods in the ASM sector?
- What are the institutional and regulatory frameworks, relationships and processes governing the ASM sector?
- What are the differential assets, capabilities and livelihood activities of ASM miners? (Impact on individuals/households/communities)
- What are the differential capacities to exercise voice and claim rights and entitlements in the ASM sector?
- What are the potential medium and long-term impacts on livelihood security related to ASM?
- What interventions would increase the security (economic, political, social) of ASM miners?

Expected outcomes from the Livelihoods Study include valuable insight into how livelihoods of miners could be improved, policies and strategies to reduce vulnerability, mechanisms for inclusion of livelihoods issues into short, medium and long term government policy processes and development of corresponding initiatives (D'Souza, 2003b).

D'Souza (2003b) further outlined a related Policy Project that will conduct a detailed baseline profile of socio-economic, technical, environmental and health issues in the ASM sector in participating countries (Ghana, Tanzania and Zambia). Characterization of the regulatory framework, including an analysis of the mining legislation and roles of various institutions, will provide considerable insight into avenues for improvement. One of the main objectives of the project relates to the creation of a culture of participatory engagement. Multi-stakeholder participation in the siting and design of regional training centres, as well as in sustainable sector planning will encourage buy-in from the participants. Training in environmentally-friendly technologies at regional centres will be coupled with development of credit and marketing schemes appropriate to the sector.

By linking broader policy-level initiatives with on-the-ground action, the "integrated policy and practice" model promises to facilitate both long-term, positive change in the ASM sectors in Ghana, Tanzania and Zambia and provide invaluable lessons for other interventions throughout the world.

Box Five: Building Livelihoods and Adding Value

The concept of *mining clusters* has most recently been captured in a comprehensive book put forth by UN Economic Commission for Africa (UNECA, 2002). Looking at both the large-scale and small-scale mining sectors, UNECA (2002) defines mining clusters as “a concentration of expertise among closely linked industries and companies in which extensive investment in specialized factors of production stimulate growth”. Complementary to this, the links between ASM and livelihood diversification are further purported. Although the mining cluster concept and livelihood diversification has considerable progress to make in the context of ASM, it has long been believed that building livelihood opportunities presents a tremendous opportunity in terms of advancement of the sector.

Fostering the linkages that arise from mutual interactions, specifically upstream, downstream and lateral livelihood prospects should be incorporated into ASM development strategies. However, UNECA cautions, efforts should seek to build on existing linkages rather than creating new clusters. Further, experience has shown that enclaves, or mono-industry, development should be avoided as these create a situation of unbalanced economic development. The government’s role in mining cluster development includes ensuring that the competitiveness of resource-related *as well as* extractive industries is maintained.

In recent years, the development of value-added processes has become a key component of a growing number of ASM efforts. In addition, linkages with other sectors have been successful when market demands are amenable to alternative livelihood development. Noteworthy examples include the following:

Adding Value to Gemstones (Tanzania):

A centre for training in Gemstone Cutting Techniques has been set-up in Arusha in order to foster the development of lapidary and stone cutting skills (UNECA, 2002). Financed by a World Bank funded “Mineral Sector Development” project, the centre seeks to build Tanzanian capacity to add value to tanzanite and other gemstones produced in the country. Government contributions to the centre decreased from 80% in 2002, most of which were directed towards capital costs (infrastructure and equipment), to 20% in 2005, at which time the government will sell its share to the public (UNECA, 2002).

Mining and Agriculture, Construction and Jewellery (South Africa):

In South Africa, the new Minerals and Petroleum Resources Act has emphasized the importance of adding value to minerals and has required that a social plan be in place when applying for a mining license (Mutimeri and Veiga, 2003). The inclusion of value added processes, for instance beneficiation, and building cross-sectoral linkages has potential to enhance the viability of mining-manufacturing or mining-agriculture ventures, extending the social benefits derived from mining on a local and regional level.

Targeting high-poverty regions in South Africa, a number of related initiatives have been undertaken by Minteq in collaboration with others. Key mechanisms for success include correspondence with local market demands, such as a brickmaking project that coincides with a local housing construction project, an agrogeology initiative, which links industrial wastes with the needs of farmers by developing low-cost fertilizers, and a jewelry project, wherein women produce unique jewelry from recycled pop-bottles mixed with locally-produced kaolin (Mutimeri and Veiga, 2003).

Rocks for Crops (Uganda, Kenya, Brazil, Indonesia)

Recognizing that agriculture is often the dominant livelihood activity and that soil fertility is on the decline in many agriculture-dependent countries, the growing ‘Rocks for Crops’ movement is trying to link “agro-minerals” suitable for use in other sectors with local markets (Van Straaten, 2002). Agrominerals include nutrient providing rocks, such as phosphate and nitrogen and potassium salts, as well as soil amendment minerals, such as limestone, perlite, vermiculite and volcanic scoria (Van Straaten, 2002). Working with miners and farmers, the Rocks for Crops programme is seeking to provide opportunities for both sectors by connecting the mineral with the market, thereby building livelihoods and benefiting both sectors as well as the community at large.

9.3 Conflict Resolution

Building sustainable livelihoods is virtually unattainable when human security is at risk. Unfortunately, conflict is pervasive in many ASM communities throughout the world. The nature of a conflict is highly dependent on the circumstances in which ASM takes place (e.g. rush versus permanent), the characteristics of the mining region (e.g. social, cultural, economic) and the legal and political framework in which these activities are embedded. Five main types of conflict occur in ASM communities: domestic, multiple land use, cultural or ethnic, legal, and political.

In the case of the domestic, multiple land use or cultural conflict, disagreements are often catalyzed and perpetuated by the social and environmental disruption caused by ASM. The characteristics of the ASM community seem paramount to the nature and intensity of conflict. For example, unlawful activities (e.g. drugs, violence and prostitution) may be more prevalent in *ad hoc* communities created in response to a 'rush', than in well-established communities where government presence may be more significant, familial ties are stronger, and social cohesion is more evident. Conflicts between miners and other land users, elders (e.g. related to ancestral lands), downstream communities (e.g. related to damage to waterways) have been reported throughout the world. The challenges in enforcing laws in remote regions, combined with the often informal nature of ASM activities, can lead to serious threats to the personal security and wellbeing of residents of ASM regions.

Most efforts related to ASM and conflict have, however, predominantly focused on the relationship between miners and mining companies or governments and the capacity of high unit value commodities, such as gold or diamonds, to fuel conflicts (Box 6).

This attention is certainly warranted. Acts of violence perpetrated on artisanal and small-scale miners by local police or military have been reported throughout the world; most cases are associated with conflict with large-scale companies over control of the resource, the forced removal of miners and their families from properties or unfair compensation for resettlement. Between 1990 and 1998 in the Tarkwa mining region of Ghana, the displacement of 30,000 people (including many illegal miners) and violent attacks, arbitrary arrests and other human rights violations were reportedly perpetrated by armed men in order to clear the way for large-scale mining development (Awudi, 2002). In cases where such acts have occurred, most large-scale mining companies contend that they had no prior knowledge or authorization of the violent actions.

In some cases mining companies have been shown to be the instigators of conflicts; alternately, mining companies may play no role in the conflict but may benefit from it, they may take an active role in resolving conflicts or they may be victims of conflict (Switzer, 2001). For example, in response to the eviction of illegal miners from property controlled by the Brazilian company CVRD, displaced miners took seven company employees hostage until their demands were met (Rosenfeld-Sweeting and Clark, 2000). As most mining

companies conduct exploration, in part, based on the presence of artisanal and small-scale miners, and ASM activities are continuing escalate, conflicts between informal and 'formal' miners will likely intensify in the coming years.

The Way Forward

International companies, governments and other stakeholders increasingly recognize that sustainability will only be realized once win-win solutions to development challenges - including the prevention and mitigation of conflict - are identified (Garcia Larralde, 2003). "It is becoming increasingly clear, that in the mid- and long-term, win-lose situations tend to convert to lose-lose situations" (Garcia Larralde, 2003, p.1). Every CASM AGM has sought to build capacity of participants to prevent and resolve conflicts, in part by building and strengthening tri-sector partnerships between governments, mining companies and communities.

Although consensus building may not be appropriate to all situations, it has considerable potential to achieve long-term resolution compared to other processes (Ali, 2003). Alternative Dispute Resolution (ADR), a frequently employed approach, can effectively reduce litigation costs, but may also harm relationships between affected parties, impeding the implementation of future conflict resolution efforts (Ali, 2003). ADR may, however, be appropriate in criminal cases or certain negotiation processes. Democratic processes enables finalization of a process (at least in the short term), but it almost inevitably does not benefit all parties. Even in consensus-building processes, not all parties may be satisfied but, as the intent is to create win-win situations, the likelihood of prolonged resolution is significant (Ali, 2003). Thus, CASM efforts in conflict resolution have focused on consensus building processes, a powerful tool not only to resolve conflicts, but also to strengthen relationships between stakeholders and chart a course for participatory management of mineral resources.

A trained facilitator best supports participatory engagement processes. According to Garcia Larralde (2003), impartial facilitators can significantly aid in group decision-making processes. At a macro level, a good facilitator will analyze the situation as an impartial third party, design the process, encourage agreement on the rules of engagement and assess the process and adjust accordingly. At a micro level, a facilitator will promote trust, ensure both a positive environment and effective participation, and will enable decision making. Cultural sensitivity, impartiality, confidentiality and a capacity to address power imbalances are critical facilitation principles. In tri-sector processes, government officials are often called on to act as mediators. Due to their interest in mining royalties and taxes, they often lack the impartiality needed to successfully facilitate these processes (Ali, 2003).

To identify potential participants in the process, the focus should be on groups affected by the issue and those with the power to implement or impede potential outcomes. Consideration of a range of stakeholders may include governments, industry, unions, small-scale miners, communities, indigenous peoples, non-government organizations, funding and development agencies, colleges, schools, and the academic community, and other associations and organizations. All participants must receive the training necessary to ensure their full involvement in the participatory process (Katz, 2003).

Representatives of a given group should confirm whether they are accountable to their groups or constituencies.

Deep understanding of the diverse aspects of a conflict requires a detailed conflict assessment. A first step involves characterization of the various stakeholders involved – including miners, companies, NGOs, community-based organizations (CBOs), indigenous groups and local residents, local, regional and national governments (Ali, 2003). A broad spectrum of issues and priorities relevant to these individuals and groups will inevitably emerge from the assessment process. These may range from environmental (e.g. degradation and land use) and economic (e.g. market prices, taxation) to legal (e.g. land rights) and social (e.g. erosion of traditional values).

Once embroiled in a conflict, the natural tendency of affected parties is to view issues in black and white, thereby polarizing the situation (Ali, 2004). Even if firmly entrenched in their positions, parties involved must strive to understand the perspective of an 'opponent', as well as their own. Asking three key questions provides some clarification (Ali, 2003):

- Is it about a company or a concept?
- Is it about an issue or an ideal?
- Is it about resistance or resolution?

Understanding the power held by all stakeholders, and power differentials between them, is also necessary to conflict resolution. There are many aspects of power. These include, but are not limited to: formal power, which is typically dictated by position; skills and knowledge, the nature of which varies in all individuals and organizations; character or ethics, which has the potential to confer trust and respect; the power to punish or, conversely, reward; and referent power, which seeks to appeal to a common goal. A skilled facilitator recognizes that unbalanced power structures can derail the process and must be addressed throughout process design and facilitation. Some capacity building may be required, for instance, of mining companies on local cultural issues, or of indigenous groups on large-scale mining practices.

Building trust, a critical building block of conflict resolution, often requires the establishment of common ground. Ali (2003) identified four key factors in trust building: repeated interactions, reliability and accountability, quick feedback of changes, and long time horizons. By recognizing similar interests, even outside the realm of the conflict, is one means to find these commonalities. Frequent interaction, often on terms both specific and unrelated to the negotiation or mediation process, can aid this considerably. As trust develops, a common vision can be created, with its shared pursuit marking an important shift in the process.

Conflict resolution does not merely consist of mitigating current conflicts, as is the case for conflict management (Ali, 2003). Visionary mining companies are proactively working with stakeholders, including artisanal and small-scale miners, to develop shared strategies to address current and anticipated sensitive environmental, economic and social issues. This model of cooperation represents an important opportunity to add value beyond the resolution of conflict, laying the foundation for advancing the cause of sustainable development.

Box Six: Conflict Diamonds

A major concern with both ASM and large-scale formal mining activities relates to their capacity to finance conflicts. Congo, Sierra Leone and Angola are prime examples where intra-state or internal conflicts have been fuelled by mineral wealth (Fodha, 2000). ‘Conflict diamonds’ have been used to finance rebel forces’ purchase of arms and their insurgent activities against the legitimate and internationally recognized government of the relevant country (UN Security Council, 2000). In effect, diamonds, coltan and other valuable commodities have also supported the privatization of security, i.e. by financing mercenaries and private military companies (Musah, 2002). As they are recouping considerable funds from these ventures, private armies and rebel groups have a vested interest in perpetuating these conflicts, and therefore political insecurity, in these regions.

Diamonds can have a tremendous impact on national economies and standards of living. In Botswana, where diamonds make up 79% of total exports, there exists universal health care and education. Conversely, in Sierra Leone, where diamonds make up 0% of official exports yet 20% of the GDP, health, education and other indicators are drastically lower (Hazleton, 2003; Kpetewama, 2004). ASM continues to represent an important source of livelihood in these highly unstable regions; more than 30% of the diamond production in Angola, for example, is attributed to ~100,000 artisanal miners (Coakley, 2000). However, wars funded by conflict diamonds have resulted in the deaths of hundreds of thousands and have led to widespread displacement and decimation of national institutions, mainly in Angola, Sierra Leone, Liberia and the Democratic Republic of Congo.

Approaches to conflict diamonds have involved both higher level policy initiatives and grass roots community-based programmes.

Conflict Diamonds and the Kimberley Process

The Kimberley process, an international certification system for rough diamonds, has been proposed as one means to prevent the purchase of conflict diamonds. Countries are accepted as signatory to the process when they establish national legislation and mechanisms that meet the requirements put forth by the certification scheme. The Process has some obvious limitations, for instance, countries such as Dubai, who choose not to be signatory to the Process, can erode the strength of the initiative. Also, tracking the origin of diamonds smuggled into participating countries continues to be problematic, but is one issue for which new technologies are likely to be developed in the future. Hazleton contends that the Kimberley Process is “not a panacea, but a move forward in processes that deal with illegal diamonds”

Integrated Diamond Management Proposal (IDMP)

A non-profit association of private and public organizations, the Peace Diamond Alliance (PDA) is actively working in Sierra Leone to transform diamonds from a source of conflict to one of human development (Kpetewama, 2004). Three elements comprise the Integrated Diamond Management Proposal (IDMP): financing to provide credit to cooperatives, a buying scheme enabling diggers to receive fair prices from credible buyers, and Earth to Export scheme to track diamonds from extraction until they are delivered overseas. Currently, PDA is training local miners although certain challenges persist: attaining buy-in at a community level, gender mainstreaming, expanding the training programme, and continuing work on alternative livelihood development (Kpetewama, 2004).

Diamond Area Communities Development Fund (DACDF)

In 2001, the government of Sierra Leone initiated the Diamond Area Communities Development Fund (DACDF). Through the programme, 25% of diamond export taxes are distributed to diamond mining communities for use in a wide range of development projects (Kpetewama, 2004). These include health centers, road construction, and community centers. The Peace Diamond Alliance is monitoring these activities to ensure funds are reaching communities and achieving the benefits desired.

Peace through policy and peace through development – jointly these projects reflect the need for cooperation between communities, NGOs, governments and multi-lateral agencies to prevent future conflicts and facilitate positive change in the wake of horrific tragedy.

9.4 Microcredit, Financing and Sector Development

Development of the ASM sector hinges on access to financing. Without adequate funds, miners have little opportunity to improve the technical and economic performance of their operations; thus, lack of access to financing is one of the key constraints to development of the ASM sector. Lending institutions are hesitant to grant loans to “high risk” artisanal and small-scale miners who lack collateral, and generally have little knowledge of mineral reserves and limited financial management capacity. Even if funds are accessible, commercial banks and formal lending institutions often prove to be further problematic due to the distance to bank branches and difficulty in paying back money borrowed for failed ventures. Access to sustainable sources of financing requires a paradigm shift in thinking on the part of financial institutions, government agencies and other potential financing sources. Concurrently, capacity in management, bookkeeping and entrepreneurial skills should be developed in miners.

UNECA identified several examples of Best Practices in Africa for five main types of credit and financing options. These alternatives may be appropriate to ASM in a number of contexts (*after* UNECA, 2002):

- *Loan-based Financing Schemes*: Loans from government programmes, domestic banks, microcredit institutions or other facilities;
- *Equity-based Financing Schemes*: Financial risks are shared by joint ventures, investment banks, mutual or venture capital funds, stock exchanges or trusts;
- *Hire-purchase Schemes*: Miners rent or rent-to-own equipment by making fixed payments over an established time period (usually based on the value of equipment);
- *Cooperation Between Large and Small Scale Miners*: Large companies provide assistance in the form of loans, sometimes issued through trust funds, usually in conjunction with technical or other support. In some cases, equipment is provided on a rent-to-own basis (also see Ch. 8.4); and
- *Buyer Credit Schemes*: Mining companies or other organizations act as buyers and provide assistance in marketing commodities. In some cases, equipment or milling services are provided to miners with purchase prices being reduced to cover these costs.

Generally, the conditions associated with these funding sources, in particular those offered by formal lending institutions, preclude access to most artisanal and small-scale miners. Joint ventures, equity sharing or investment funds are also unattainable to most miners due to the equally complex criteria; however, some examples of partnerships with mining companies have proved successful.

Sensitizing both institutions and companies about the risks and opportunities specific to ASM as well as artisanal and small-scale miners about the criteria required to attain funding are the first step to overcoming these barriers. One means of undertaking this are through multi-stakeholder events. For example, an ASM fair was held in northern Tanzania to enable a face-to-face meeting between more than 3,000 miners and domestic banks, NGOs,

government authorities, equipment dealers and fabricators (Mutagwaba, 2005).

Financial institutions should be encouraged to establish credit programmes with reasonable interest rates or creative banking arrangements, such as mobile banks, in key mining areas (UNECA, 2002). Third party intervention may nevertheless be required to establish a formal link between these institutions and miners. Third party guarantors, potentially NGOs or mining companies, could provide both the reputation needed to secure funds and financial management skills training to support loan payback (UNECA, 2002).

In addition to formal lending institutions, a number of other alternatives may be available to artisanal and small-scale miners. These include government loans, microcredit, microequity (i.e. small grants), and community-based savings schemes.

Government Loan Facilities

Special government programmes aimed at developing the ASM sector and encouraging formalization and legalization have been undertaken in a number of countries. For example, in Namibia, a Mineral Development Fund (MDF) has provided US\$ 92 million in loans and US\$ 9 millions in grants for large and small-scale mining projects (Malango, 2004). Expenditures for the programme have totalled US\$ 104 million. With low interest rates, an ample repayment period (5-years plus a 2-year grace period), sufficient management resources and minimal bureaucratic requirements, 92% of loans have been repaid. Projects funded have included shaft sinking, an exploration project, expansion of an open pit fluorspar mine, diamond recovery vessels, a garnet mine and two failed tourmaline projects (Malango, 2004).

The Government of Zimbabwe has also implemented a number of loan-based support programmes targeting the ASM sector. These include: loans to develop mines (including 6-months of operating costs for new plants); emergency loans (up to \$Z 4,000 repayable within one year) for mines that risk cessation of activities; and the Mining Industry Loan Fund (MILF), which loans up to \$Z 2 million annually (Dreschler, 2001, UNECA, 2002).

A government administered, Mineral Development Fund (Fundo do Fomento Mineiro, FFM) provides financing to small-scale miners in Mozambique. Miners must provide a copy of the mining licence, proof of collateral (20% of loan amount), a feasibility study (including verification of market), and a plan for loan repayment (Dreschler, 2001). Although these criteria may be out of reach for many artisans, the programme provides a viable mechanism to encourage development of small-scale mines.

Microcredit

Microcredit institutions, found in most developing countries, provide a more accessible source of funds for “first-time or less credit worthy” miners and their communities. Given their need to be sustainable, however, microcredit may be ineffective in reaching the poorest of the poor or those deemed “high-risk” (Prete, 2002). Although they may be easier to access than other funding channels, low-return or failed ventures have been shown to result in borrowers

selling assets to pay microfinance institutions or borrowing from moneylenders, all in order to maintain a positive credit rating. Some borrowers who have had difficulty in repayment have also been stigmatized in their communities. Moneylenders often charge exorbitant interest, even as high as 20% per day (Prete 2002).

Although the development of microcredit programmes appropriate for ASM should be encouraged, it should be noted that directed credit initiatives may be unsustainable as they require greater promotion efforts, may necessitate greater subsidies, and do not adequately consider risks (von Pishke, 1999). Sustainability of microfinance institutions is essential as borrowers value the opportunity for continued access to credit and “one-off” loans are unlikely to be repaid. The “Consultative Group to Assist the Poorest” (CGAP, 2003) indicates that only 1% of the microfinance institutions in the world are sustainable and another 3% have the potential to be sustainable.

Microequity

Often criticized as being unsustainable and paternalistic, small grants programmes – or “microequity” - may nevertheless enable even poorest of the poor to obtain the capital needed to kick start an entrepreneurial venture (Pretes, 2002). Many ASM interventions currently include small grants components as a means to provide much-needed financing to the sector. Much like partnerships between the entrepreneur and financier where equity grants seek to achieve financial returns, grantmaking agencies desire social equity, i.e. human development returns.

These grants often respond to a spectrum of needs that range from to community health and basic skills training to increasing financial management capacity and facilitating market linkages (CGAP, 2003). Extending beyond direct provision of funds, these grants target many of the fundamental barriers to improvements in the ASM sector (Fig. 7).

Figure 7: The Non-Financial Services Continuum
(After CGAP, 2003)

SOCIAL INTERMEDIATION		BUSINESS DEVELOPMENT SERVICES		
<i>Subsidized</i>		<i>Fully Commercial</i>		
Health Education	Literacy Training		Entrepreneurial Training	Market Information Centres
Provision of boreholes for water	Organizational Capacity Building		Business Networks and Linkage	Market Linkage Schemes

Most granting facilities, however, seek to improve the economic performance of ASM and catalyze diversification in ASM communities. Transaction costs of small grants may be lower than for small loans and granting facilities can enable recipients to graduate to market-based funding sources (CGAP, 2003). Grants must, nevertheless, be well-structured and closely monitored to reduce fungibility (i.e. when funds are not used for its stated purpose or when the funds were borrowed for an activity that would have been undertaken without the loan). Most ASM granting programmes require a cash or in-kind

contribution from the recipient and satisfaction of specified criteria, both of which ensure forethought into the proposed endeavour. These conditions may be difficult to achieve for many miners (D'Souza, 2003b). As they provide an income stream in the short term, many ASM investments may be better suited to microcredit than small grants; however, many of these ventures are too risky even for microcredit institutions and may therefore have prohibitive borrowing terms.

Providing grants to small groups for “microenterprises” can generate sufficient peer pressure to reduce the risk of misuse, which would preclude future access to funds (e.g. subsequent grants, microcredit). Prete (2002) defines microenterprises as firms with fewer than five employees; they are typically unregistered and do not pay taxes. Microenterprise development should be considerate that regulatory requirements and excessively bureaucratic procedures for registering and operating a microenterprise can act as a disincentive to their creation and growth (CGAP, 2003). In addition, entrepreneurs must have technical skills to create the proposed “product”, managerial and accounting skills and an understanding of markets and prices.

Community-Driven Funding Programmes

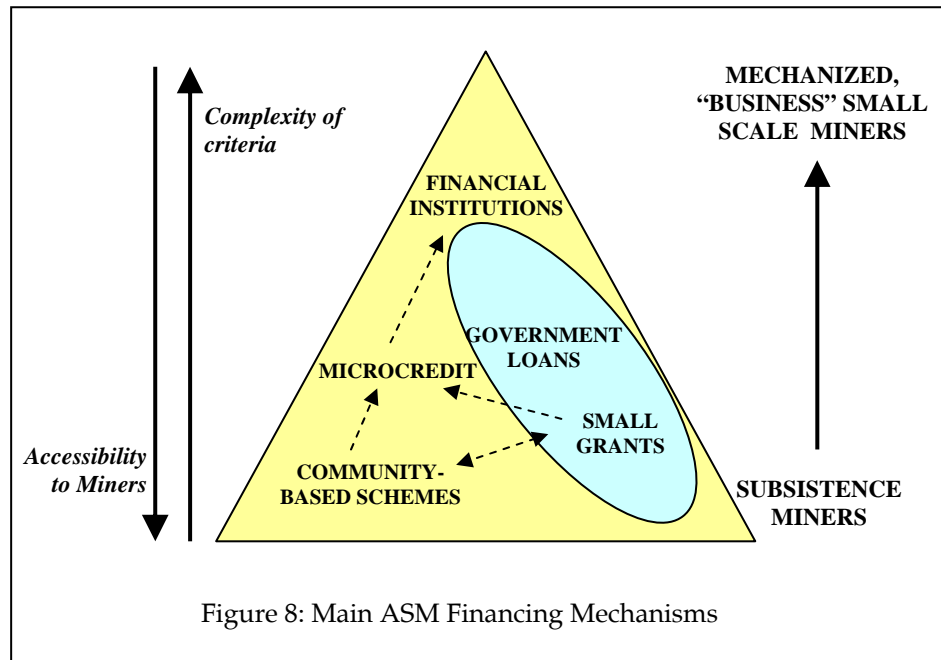
Community-driven funding structures, such as group savings schemes, are already evident in many rural communities throughout the world. Group savings pools are known by a variety of names in different countries: *hui* (Vietnam), *partner* (Jamaica), *pasanaku* (Bolivia), *susu* (Ghana), *tontine* (Mali), *chikola* (Kenya), and *stockvel* (South Africa), for example (Coyle, 2002). The simplest of these arrangements involve members of a group contributing a set amount of money on a weekly or monthly basis to a common pool. Each group member subsequently takes turns receiving the funds for either investment or consumption purposes (Coyle, 2002). As group members are under pressure from peers to maintain inputs, misuse may preclude future access to the funds. This arrangement requires a good degree of trust and some financial management skills, and is highly susceptible to collapse in times of shock (e.g. drought, epidemics).

External support, typically by NGOs, is often needed to oversee village bank models. In Bolivia, the CRECER model involves granting to groups of 5 to 8 self-selected members. No collateral is required as members guarantee each other. The group convenes weekly or bi-weekly for mandatory meetings, which include an educational component that addresses a range of topics (e.g. healthcare, nutrition, small business management) (Simanowitz and Walter, 2002). The Grameen Bank Model, initiated in Bangladesh, lends to individuals as well as groups of 7 to 8, which come together in centers of 35-40 members. Small loans are offered at 20% interest per annum payable over 50 weeks. Lending is ensured against risk through a micro-saving and insurance system. Pre-lending training includes a “Group Recognition Test” to ensure members understand programme rules and regulations. In both cases, initial loans are small, which enables groups to increase management capacity as they graduate to larger loans (Simanowitz and Walter, 2002).

Although village savings or banking schemes are poorly documented in the ASM sector, evidence of community-driven financial support is a testament to its potential viability. For instance, the Igarot gold miners of northern

Philippines share gold ores with less fortunate miners in both the spirit of aiding those in need and the belief they will be blessed with rich finds (Bugnosen, 2001). In a single village in Bushenyi District of Uganda, two women’s associations and one youth association have initiated group savings schemes (Hinton et al., 2005).

For many miners, village funding schemes are more accessible than other avenues. Although the amount of funds provided is often too little to enable major technological upgrades, they may nevertheless be an effective means to catalyze certain micro-enterprises, such as shops for simple equipment (e.g. hammers, shovels, wheelbarrows) or small restaurants. Over time, these businesses may attain enough capacity and collateral to qualify for larger loans or grants, for instance through local microcredit institutions or small grants programmes (Fig 8). In theory, development through microcredit may further graduate to access to larger financial institutions (e.g. domestic banks), but numerous barriers continue to restrict access to both microcredit and domestic banks, including poor understanding of the needs of miners and the perceived and real financial risks associated with ASM investments.



Governments, development organizations, NGOs and CBOs have an important role to play in facilitating access to financing. Through efforts to organize ASM, for instance related to legalization initiatives, support can be provided for the establishment of formal enterprise groups, miners associations or cooperatives that can investigate different financing options, including group savings schemes, small grants programmes and the development of informal finance institutions, such as miners’ cooperative banks (UNECA, 2002). Small entrepreneurial groups or companies are advocated by some more so than cooperatives or associations as they have lower administration costs and often act more decisively (Lara, 2002; Wotruba, 2003). This is not to say that these other types of organizations, or individual entrepreneurs for that matter,

cannot be equally effective in seeking, obtaining and managing funds for ASM and related activities.

The funds provided through government loans and small grants programmes can further facilitate the improvements needed - not only in terms of economic performance, but in development of the skills needed to access and manage funds - for graduation to “external” (i.e. non-directed) financing mechanisms.

Overcoming the barrier of financial access for ASM requires a major shift in thinking, particularly on the part of financial institutions and key government agencies. This is, nevertheless a worthy challenge and, once forged, partnerships between miners and funding sources can make a major contribution to the development of the ASM sector into one which effectively supports the reduction of poverty.

9.5 Fair Trade Initiatives

Access to fair markets is a critical issue in terms of ASM sector development. The formal and informal mineral trade continues to be both a positive and negative force for those engaged in ASM, as it provides market access yet often perpetuates poverty. Five main types of producer-buyer arrangements exist:

- Transient buyers travel from ASM site to site and, once a substantial amount of material (refined or unrefined) has been obtained, it is sold to a “higher level” buyer or consumer (e.g. cement companies in the case of limestone);
- Large consumers purchase directly from artisanal and small-scale miners, usually on a per unit weight basis;
- Small- to medium-sized licensed miners (who may or may not be producing themselves) purchase product, based on weight and quality, from miners active on their concessions;
- Mined materials are traded for other goods; and
- Minerals are legally or illegally sold directly to foreign buyers.

Likely with the exception of the direct foreign market sales, the purchasing price from the artisanal or small-scale miner is well below fair market value. Although the formal and informal mineral dealers bear the brunt of transportation costs, the nominal prices paid to artisanal miners exacerbate the low incomes and levels of poverty that pervades the ASM sector. Typically, the greater the number of intermediaries, the smaller the profit for the artisanal or small-scale miner. As many miners are working in remote locations with little access to or knowledge of outside markets, and this arrangement provides a steady cash flow (provided production is also steady), low market prices persist.

Most artisanal and small-scale miners, as well as low-level buyers, are extremely concerned about market access and obtaining fair prices for their products. However, as the current arrangement provides an accessible market, many miners accept purchase prices well below fair market value in order to sustain themselves, resulting in the perpetuation of the system. In many cases,

miners are unaware of the international market value, thereby limiting their power to negotiate a decent price. This is further compounded by lack of knowledge concerning the quality of the product, often on the part of both the miner and buyer. As a consequence, any efforts to improve the ASM sector must also consider the mineral trading cycle and its stakeholders.

Recognized as a major inhibitor to poverty reduction in the ASM sector, many countries have attempted to address the lack of market access and/or fair market prices. Fair trade initiatives have attracted increasing attention as they provide both a mechanism for fair market access and incentive for improved environmental, social and economic performance of ASM activities.

Case Study: Oro Verde in Colombia

In the Choco region of Colombia, the Oro Verde Corporation (“Green Gold”), formed by two local CBOs, an NGO and the Fundación Amigos del Chocó (AMICHOCO), has undertaken a fair trade initiative that encourages environmental and social responsibility in conjunction with a community-driven certification system (Cock, 2004). With widespread ASM-induced environmental destruction in the area, including erosion, loss of biodiversity and degradation to waterways, the fair trade programme has a number of strict rules for participation. There is considerable incentive for miners who are certified through the programme – Oro Verde offers a premium price for their gold. Requirements for participation include (Cock, 2004):

- Irreparable, large-scale environmental damage is prohibited;
- Organic soils cleared for ASM should be stockpiled and used for future reclamation;
- Use of toxic chemicals (e.g. mercury, cyanide) is prohibited;
- Sediments eroded or tailings discharged to aquatic systems should be in sufficiently low quantities to prevent damage;
- ASM activities must be first approved by the Community Council;
- Biodiversity indicators should be identified and measured throughout the mining process;
- In forests, ASM should effect no more than 10% per hectare within any two year period;
- Statements of gold origin must be provided; and
- Local, regional and national laws and regulations must be adhered to.

Support for the programme, such as education, training, and reclamation, is provided by local NGOs and CBOs, while AMICHOCO undertakes marketing and commercialization (Cock, 2004). Certifying the gold derived from participating ASM sites by ascertaining compliance has proved challenging for Oro Verde but necessary to make the Oro Verde fair trade “brand” marketable. Purity of product, environmental protection and social responsibility are key criteria to establish (Senanayake, 2004). In response to this, a number of indicators have been developed based on the values of local communities and scientific knowledge. Maintaining the audit trail (i.e. proving origin of gold) continues to be problematic, but partnerships with local refiners have aided in some respects (Senanayake, 2004).

Oro Verde has recently joined the Association for Responsible Mining (ARM), and organization created to extend certification efforts to other region. Founded in July 2004, ARM has members from Colombia, Mongolia, Peru, Sri Lanka, Philippines, Ecuador, the Netherlands, and the United States all seeking to advance economically viable 'cleaner' mining methods and socio-environmental responsibility through the voluntary certification programme (Wahl, 2004). Currently ARM is working to develop an international framework for certification concurrently with "bottom-up" efforts for sensitization and training of miners and their communities.

Case Study: Fair Trade e.V. in Latin America and Africa

A similar programme has been initiated by the German-based NGO, Fair Trade e.V. (Hentschel et al., 2001). Comprised of ASM experts, goldsmiths and gem specialists, Fair Trade e.V. has sought to proliferate fair market practices in the gem and metal trade. Criteria for participation include (Hentschel et al., 2001):

- Legally licenses ASM operations;
- Miners must be formally organized, e.g. in cooperatives or association;
- Demonstrated environmental responsibility; and
- Commitment to good social practices, including adherence to ILO conventions (child labour, worker welfare).

Miners are further encouraged to invest profits in improved practices, the objective being breaking the poverty cycle. In 2002, projects are being supervised by Fair Trade e.V. in Lesotho (diamonds), Bolivia (gold), Tanzania and Madagascar (precious gems), as well as grinding workshops in India and jewellery manufacturing in Bolivia (Hentschel et al., 2001).

Although a number of challenges persist, these fair trade initiatives, including access to international markets for certified products and the credibility of the certification system, this model shows tremendous potential as an alternative to current mineral trade arrangements and incentive for better ASM practices.

9.6 Women's Empowerment

Many contend that transforming ASM into a catalyst for human development and poverty reduction strongly depends on the empowerment of women engaged in and impacted by the sector. Women's empowerment should be mainstreamed into ASM endeavours for a number of reasons:

- Women are the least aware of and most susceptible to the negative health effects of ASM and derive markedly fewer economic benefits from mining than their male counterparts (Dreschler, 2001; Hinton et al., 2003; Lahiri Dutt, 2004).
- It is widely recognized that the revenue generated by women in ASM communities contributes more directly to the well-being of households than that of men (Hentschel et al., 2001, UNDP, 1999; ILO, 1999, Veiga, 1997).
- Women have demonstrated capacities in small enterprises that add-value to mined products (e.g. jewellery production, ceramics) and

therefore may be better suited for economic diversification programmes (Hinton et al., 2003). The majority of women involved in small-scale enterprises are sole proprietors who make little use of hired labour, or participate in income generating groups on a part-time basis (Carr, 1993); thus, they may be easily adapted to small-scale ventures. In addition, women are frequently responsible for food security and have demonstrated competencies in agriculture.

- Women have been significantly more successful than men in terms of participation in microcredit programmes. Many of these programmes have been tailored specifically to women and – although not a panacea - have shown considerable success in improving many women’s lives (Wiego, 2002).

Ultimately, due to the critical roles women play, not only in mineral production but also in the development of strong, resilient communities, improving the status of women is essential to advancing positive change within ASM communities. A number of programmes are seeking to improve the status of women and enhance their capacity to benefit from the sector.

Organizations advocating for the empowerment of women in ASM have an important role to play. The SADC Women in Mining Trust, chaired by Zambian small-scale miner, Namakau Kaingu, has members in Angola, Botswana, Namibia, Congo DR, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe (Hentschel et al., 2001). The Trust seeks to respond to women’s training needs, institute revolving loans, and to increase support for women from companies, governments and other programmes. This coupled with the African Women in Mining Network (AFWIMN), created during the 2003 CASM AGM in Ghana, creates a strong voice for women in African ASM. AFWIMN has resolved to do the following (Kaingu, 2003):

- To share information, knowledge and experience;
- To mobilize resources and funds for women in ASM;
- To strengthen relationships with African governments, CASM, gender-focused institutions and organizations and other stakeholders;
- To conduct and promote training and skills building;
- To act as a lobby group for women in ASM; and
- To support the reduction of socio-economic problems, with special emphasis on women, children and HIV-AIDS.

Organizations such as these nevertheless need considerable support to achieve their worthy objectives. Development programmes, mining companies, NGOs and government agencies have an important role to play in supporting these organizations and providing direct support to women.

For example, the Mining Sector Diversification Programme (MSDP) of Zambia has made strides in conquering the “double bind”, i.e. an unsupportive policy environment (that which limits access to land, information, credit) coupled with uncertain markets for products (Marcelle and Jacobs, 1995). This endeavour links the Zambian gemstone market with foreign buyers and builds the capacity of small miners to add value to their stones. In 2003, the MSDP sent five mining associations, including one Women in Mining association, to a

major gemstone fair in Tucson, Arizona in 2003 (Anon, 2002). Efforts to develop value-added processes in the production and marketing chain of gemstones, particularly through lapidaries and jewellery manufacturing, have been recognized as an important opportunity for women in Zambia (Kaingu, 2003).

Other assistance programmes targeting women include:

- *Brickmaking, Kwa Zulu Natal, South Africa*: Brickmaking provides a means to add value to kaolin mines, and has been shown to support sustainability in the community of Ozizweni (Dreschler, 2001).
- *ASM Training, Zimbabwe*: The Intermediate Technology Development Group (ITDG, 2002) implemented a training programme targeting women. A number of courses were completed, including mining technology, environment, occupational health and mine management. Following the programme, women were encouraged to obtain financing to initiate environmentally sound, economically viable ASM operations.
- *Alluvial Diamonds, South Africa*: Located adjacent to a large formal mine, the South African Women in Mining Association (SAWIMA) own and operate an alluvial diamond claim. With support from the adjacent mine owners and government agencies, the women were able to purchase heavy equipment for mining (UNECA, 2002).
- *Gold Mining, Mindanao, Philippines*: UNIDO (1998) specifically incorporated women in a technology assistance programme comprised of the provision of equipment and training.
- *Economic Diversification, Mali*: The Sadiola gold mining project in Mali has supported women's activities through market gardens and the fabrication of dyes and soaps.

Generally, past ASM assistance efforts have made a major oversight in not recognizing the gender-specific nature of development. By assuming that "what is good for men is good for their families", most programmes have been oriented towards the tasks, interests, and needs of men. The focus on commercial rather than domestic benefits of some development programmes has resulted, in some cases, in reduced quality of life for women (Everts, 1998, Wightman, 2001; Wakhungu and Cecelski, 1995). As women's direct involvement frequently decreases with increased scale and mechanization of a mining operation, it is easy to speculate as to how technical assistance programmes could negatively impact women. Incorporation of women in programme development and implementation represents an important opportunity for technical assistance programmes to build upon the demonstrated successes and failures of past efforts.

Significant barriers exist that prevent women from fully benefiting from ASM and alleviating poverty in their families and communities. At the heart of these constraints are gender inequities. These inequalities include political power, access to resources (capital, information, education and training, etc.), health status, mobility and basic human rights. Thus, initiatives to support women's empowerment in ASM must pay particular attention to the legal, socio-

cultural, and financial constraints faced by women. In accordance with this, the following are recommended (*after* Hinton et al., 2003):

- Commitment to gender mainstreaming in government agencies, and appropriate recognition of women in policy frameworks, particularly in relation to land ownership rights;
- Adoption of strategies inclusive of, and accessible to, both women and men, and which support women's participation in political decision-making;
- Elimination of discrimination from educational systems, and provision of support or incentives for families sending children to school;
- Explicit mainstreaming of gender issues in technical assistance and community development programmes;
- Promotion of micro-credit and other programmes that provide financing for women;
- Execution of educational campaigns that target women in order to mitigate specific health risks, and which provide the means for them to access other resources;
- Implementation of programmes to train women in various aspects of ASM, including mining methods as well as in marketing, management and bookkeeping;
- In-depth research on women's involvement in ASM communities, and the differential impact of current practices and technical change on the lives of both women and men;
- Define benchmarks, set targets and establish monitoring and measuring tools to evaluate results and chart progress or failures; and
- Disseminate best practices.

The Millennium Development Goals (MDGs) commit the international community to achieving gender equality. The MDGs and countless development programmes, national poverty reduction strategies, donors, governments and other organizations recognize that gender equality is not only a worthy pursuit, but one that is critical to human development and the reduction of poverty throughout the world. Explicit alignment of ASM objectives with the priorities of these organizations and advocating for the inclusion of the empowerment of women within ASM communities within their portfolios can aid significantly in advancing these shared goals.

10 PROFILING ASM – A FOUNDATION FOR CHANGE

Despite numerous projects and programmes over the past decades, efforts to affect positive change in the artisanal and small-scale mining (ASM) sector have, for the most part, been only marginally successful. Often narrowly focused on technical or environmental aspects, the broader community-level impacts and benefits of ASM have frequently been overlooked by policy makers, government and non-governmental organizations, multi-lateral agencies and academia.

It is now evident that the critical challenge for those working in and with ASM is to transform it into a sector which reduces poverty by supporting integrated sustainable development. In order to facilitate this transformation, it is essential that any ASM initiatives speak directly to those objectives put forth by initiatives such as the MDGs and national poverty reduction strategies. This requires markedly enhanced understanding of the interconnections between ASM and other livelihoods and strengthened relationships with stakeholders from other sectors, including a broad range of government agencies and development- and health-based NGOs.

Community, regional and national interventions are infrequently monitored; thus, a vehicle for assessing change is vital to the success of current and future endeavours (D'Souza, 2003b). The need for tools to measure performance has never been more apparent. In recognition that most baseline surveys of ASM have not provided the information necessary to effectively design or evaluate policies and programmes, CASM and the World Bank have sponsored the development of a "Toolkit for Baseline Profiling of the ASM Sector in Africa".

Baseline assessments serve as the first step in a project evaluation process. They provide the information from which progress can be measured and policies and programmes can be improved. Baseline assessments further inform future efforts and present an opportunity to develop relationships with communities and other stakeholders. Narrowly limiting baseline profiling to the ASM sector is a major oversight, mainly as it prevents understanding of the role of broader macroeconomic and political processes influencing ASM and other sectors.

Based on DFID's Sustainable Livelihoods Approach (SLA) and driven by the goals put forth by the Yaoundé Seminar on ASM in Africa (Appendix One), the Toolkit for Baseline Profiling of ASM in Africa was developed by ASM experts Richard Noetstaller, Marieke Heemskerk, Felix Hruschka and Bernd Dreschler. It represents the culmination of several phases of development including:

- Detailed review and gaps analysis of ASM baseline profiling studies conducted between 1987 and 2002 in Africa. This included 23 studies in 14 countries and one regional study that addressed six SADC countries;
- Development of an *exhaustive* list of "Potentially Relevant Issues" for ASM community profiling. This was subsequently refined to be more appropriate at the microlevel, yielding a "Priority Based Checklist"; and
- The "Priority Based Checklist", proposed indicators and methodological guidelines were subsequently reviewed by multiple stakeholders at a

CASM conference in Elmina, Ghana in 2003. This input was critical to the final product.

10.1 The Sustainable Livelihoods Approach

The main objective of the Sustainable Livelihood Approach (SLA)¹⁹ is to put people at the centre of development. Through a framework created to understand and analyze the livelihoods of the poor, the SLA provides a tool to assess poverty reduction efforts and identify opportunities to improve livelihoods.

“A livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base.” (DFID, 1999)

The SLA identifies the (a) main constraints people are facing to improving their wellbeing; and (b) assets or poverty reducing measures to which they have access. Both of these factors are dynamic and change over time. The SLA acknowledges that communities are heterogeneous and multiple livelihood strategies are used (e.g. farming, fishing, small businesses). Relying strongly on the participation of the people involved, the SLA tries to build on inherent strengths and develop positive livelihood outcomes (DFID, 1999).

SLA is a systems-based framework that tries to identify core issues and processes that affect livelihoods and the interconnections between them. Using a number of data collection and analyses methods, the SLA works with people in communities to understand: (1) the vulnerability context; (2) assets; (3) policies, processes and institutions; (4) livelihood strategies and (5) livelihood outcomes (DFID, 1999). Noetstaller et al (2004) has adopted core components of the SLA, specifically related to vulnerabilities, assets and policies, processes and institutions, to provide a basis for ASM Profiling (Figure 9).

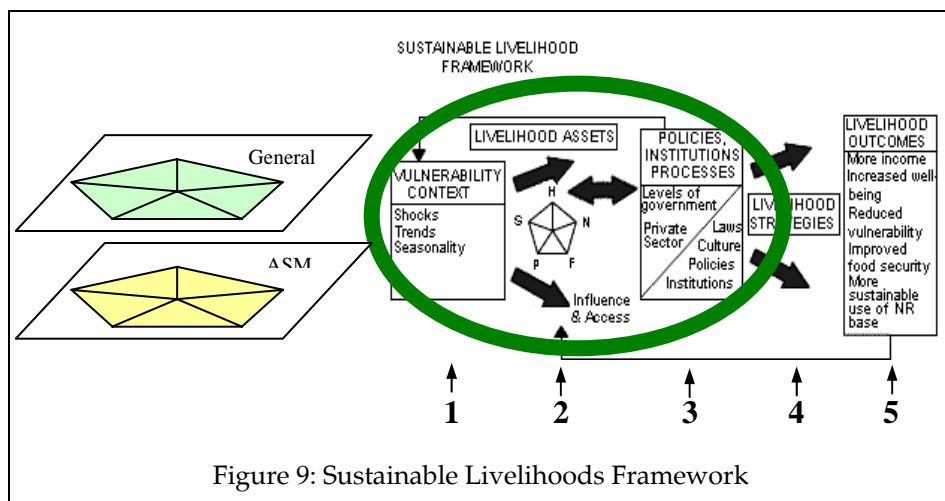


Figure 9: Sustainable Livelihoods Framework

¹⁹ DFID Department for International Development. Sustainable Livelihoods Guidance Sheets can be accessed at <http://www.livelihoods.org/>

1. *Vulnerability Context*

The vulnerability context is the environment in which people exist. It includes: (a) *trends*, such as resource, population and technological trends; (b) *shocks*, such as natural disasters, conflict, and epidemics; and (c) *seasonality* of prices, production, health and employment (DFID, 1999).

2. *Assets*

At the heart of the SLA is the “asset pentagon”, which consists of natural, human, financial, social and physical capital. Understanding the assets within communities improves our understanding of what opportunities for improvements are possible. Related questions include:

- What sorts of asset substitutions are possible?
- How are assets affected by vulnerabilities?
- How are assets created?
- How do these assets affect the range and nature of livelihood options?

The assets are categorized as follows:

- *Natural capital*: The natural resource stocks from which resources and natural processes enable certain livelihoods (e.g. arable land, forests, minerals).
- *Human Capital*: The skills, knowledge and ability to work and achieve good health that jointly enable people to achieve their livelihood objective.
- *Financial Capital*: The financial resources people need to achieve livelihood objectives.
- *Social Capital*: This includes networks and connectedness, membership in formal and informal groups, and the nature of trust and reciprocity between individuals and groups.
- *Physical Capital*: Physical capital is the basic infrastructure and tools and equipment needed to support livelihoods.

3. *Policies, Processes and Institutions*

The SLA requires consideration of the factors that have the capacity to shape livelihoods. These are the institutions, organizations, policies and legislation that determine access, the terms of exchange between types of capital and returns to any livelihood strategy. For instance, to analyze processes we need to understand what is written in the laws and regulations, what the intended effects of these policies are and what really happens in practice.

4. *Livelihood Strategies*

These are the strategies that people use in response to their living environment, (i.e. their vulnerability, assets, and structures and processes to which they are subjected). This is the range and combination of activities that people undertake in order to achieve their goals. Understanding the reasons behind the livelihood choices people have made helps us identify positive aspects that can be reinforced and negative influences that should be mitigated. The SLA does not promote any particular livelihood strategy (e.g. people should mine because the minerals are there), but helps to expand people’s livelihood options.

5. *Livelihood Outcomes*

Livelihood outcomes are the successes and achievements of livelihood strategies. People may have many livelihood goals, one of which may be income, but we cannot make hasty judgment as to what people's personal goals are. As livelihood goals are diverse, the positive outcomes are equally varied. Outcomes usually fall into one of the following categories (DFID, 2001):

- More income
- Increased wellbeing
- Reduced vulnerability
- Improved food security
- More sustainable use of natural resources

The Sustainable Livelihoods Approach provides a framework to identify, improve, appraise, implement and evaluate development programmes so that they better address the priorities of poor people at both a community and policy level (DFID, 1999). A detailed description of DFID's Sustainable Livelihood Approach can be downloaded at www.livelihoods.org.

10.2 Toolkit for Profiling ASM in Africa

This section has been heavily extracted and considerably summarized from the Toolkit put forth by Noetstaller et al (2004). The Toolkit for Profiling ASM in Africa can be accessed in its entirety at www.casmsite.org.

Founded on DFID's Sustainable Livelihoods Approach, the Toolkit for Profiling ASM in Africa is comprised of the following key components:

- (A) A checklist of critical issues and information;
- (B) Benchmark Indicators against which progress can be measured; and
- (C) Methodological Guidelines.

(A) Checklist of Critical Issues and Information

This Checklist of Critical Issues and Information includes all issues deemed "critical and necessary for consideration by decision makers in order to achieve poverty reduction and livelihood improvements in the short- or mid- term" (Noetstaller et al., 2004).

In designing the priority-based checklist, the DFID Sustainable Livelihoods Framework was used to structure necessary information on two layers (Fig. 9):

- (a) *General issues checklist*, characterizing the context of the study area; and
- (b) *Specific issues checklist*, characterizing ASM (assets, vulnerability, structures and processes) and its interconnection with other livelihoods within the study area.

Information about general issues should give an adequate introduction to the profiled area in order to ensure proper understanding and interpretation of profiling outcomes. Any study area (country, district, village) is characterized by its endowment with livelihood assets. ASM specific issues provide additional insight into the role of ASM in supporting or inhibiting this or other livelihoods.

ASM Activities

For proper interpretation of the profiling results, the underlying definition of ASM needs to be clearly defined. Frequently, county-, state- or case-specific definitions might be most appropriate in order to reflect local conditions.

General ASM	
	<ul style="list-style-type: none"> • General ASM Definition of ASM used for the purpose of profiling • Historic overview of ASM in the profiled area

Natural Capital

Natural resources are comprised of many things, including water, land, forests, biodiversity and the atmosphere. Although it is significant to those who rely on resource-based activities as a livelihood, natural capital is also invaluable in terms of local, national and global health and wellbeing.

Natural Capital	
General Issues	<ul style="list-style-type: none"> • Overview of significant (non-mineral) natural resources of the profiled area • (Non-mineral) natural resources required by ASM • (Non-mineral) natural resources potentially affected by ASM
Specific Issues:	
<i>Available Assets</i>	<ul style="list-style-type: none"> • Inventory of mineral resources and types of deposits exploited by ASM (including estimates of extension, tonnage and grade) • Past, actual and projected future mineral production by ASM, obtained from official statistics and reasonably verified by field observation
<i>Vulnerabilities</i>	<ul style="list-style-type: none"> • Requirements for obtaining formal access to resources (mining titles, land rights, etc.) and resulting distribution of formal and informal ownership of properties. • Inventory of existing conflicts of resource usage (conflicts between different segments of mining, conflicts due to environmental concerns, conflicts due to land or water use,) • Environmentally-sensitive areas occupied or targeted by ASM and existing geohazards in ASM areas.
<i>Structures and Processes</i>	<p><u>Transforming Structures</u></p> <ul style="list-style-type: none"> • Mining authorities, Geologic services, Environmental authorities • Key-stakeholders of the private sector (Mining companies, Chambers of Mines, NGOs, etc.) <p>Inventory of existing conflicts of resource usage (conflicts between different segments of mining, conflicts due to environmental concerns; land or water use,)</p> <p><u>Formal Processes</u></p> <ul style="list-style-type: none"> • Mining rights, Land rights, Water rights, Indigenous rights • Titling issues, legal status of ASM (Number of licensed operations by type, Number of pending licenses, Estimated number of unlicensed mines/miners) <p><u>Informal Processes</u></p> <ul style="list-style-type: none"> • Cultural rules, norms and practices determining the “approval” of ASM activities by local communities and consensual access to the deposit. • Political and cultural factors determining access to and power over natural capital, including inequality based on gender, wealth, and ethnicity.

In the context of ASM, natural capital is critical to livelihoods and may negatively or positively impact natural capital and the livelihoods of others. As the extent and magnitude of mineral resources (“mineral reserves”) at a given location is not known by most artisanal and small-scale miners and, in many cases, they do not have legal access to the land, miners are restricted from obtaining the financing needed to development mines and access to more efficient and, ideally, more environmentally friendly technologies.

Human Capital

“Human capital represents the skills, knowledge, ability to work and good health that together enable people to pursue different livelihood strategies and

achieve their livelihood objectives.” (DFID, 2003). Although many miners enter the ASM sector with limited training in mining, ASM requires a range of skills from geology, mining and mineral processing to marketing and financial management.

Human Capital	
General Issues	<ul style="list-style-type: none"> • Excerpt of relevant statistical data on population, education, health (nutrition, STDs, mortality, ... etc. • Listing of ethnical and religious groups, resuming significant cultural issues and differences • Resumed results from existing PRSP baseline studies • <i>Note: For all items, gender-disaggregated data if available!</i>
Specific Issues:	
<i>Available Assets</i>	<ul style="list-style-type: none"> • Population involved in ASM and their idiosyncrasies; Break down of information (per age, gender, regions, mines); Origin of population (local or migration), Socio-economic-cultural stratification according to level of participation; Skills, knowledge and experiences; correlation with technical level and/or economic level (business skills) of operations or communities • Compilation of statistics and registers describing health conditions, nutrition standards, educational opportunities (availability of primary, secondary education) in the ASM communities. • Access to further capacity-building information: general and ASM-specific information (training materials, commodity prices) • Rules of access to human capital resources based on gender, age, wealth, or other characteristics
<i>Vulnerabilities</i>	<ul style="list-style-type: none"> • Specific occupational and environmental health risks of ASM • Health, educational and nutritional situation for children; incidence and character of child labor: physiological issues, health hazards of child labor, educational issues • Possible correlation between incidence of AIDS and ASM specific conditions (percentage of HIV infected people reported higher or lower than in national average?) • Identification of the most vulnerable groups in ASM communities.
<i>Structures and Processes</i>	<p><u>Transforming Structures</u></p> <ul style="list-style-type: none"> • Health care facilities in ASM communities (public, private and traditional health care) (quality, quantity, roles, accessibility) • Educational (schools) and training facilities <p><u>Formal Processes</u></p> <ul style="list-style-type: none"> • Access to public healthcare, education, social security for ASM miners and their families <p><u>Informal Processes</u></p> <ul style="list-style-type: none"> • Self-help activities and practices • Personal capacity building, forms of leadership, list of identified leaders.

Financial Capital

Financial capital refers to the financial resources people need to achieve livelihood objectives. Although ASM income levels are sometimes higher than those obtained through non-mining, rural livelihoods, miners and their families are, for the most part, quite poor.

This may be, in part, attributed to the informal, illegal and often temporary nature of ASM, which may prompt people to invest surplus revenues in other sectors rather than back into mining. Alternatively, the spending patterns of miners also may be an issue as it is frequently reported that revenues are spent meeting personal rather than family needs.

These spending patterns and cross-sectoral flows of economic resources are directly linked with ASM’s capacity to contribute to alternative livelihoods.

Financial Capital	
General Issues	<ul style="list-style-type: none"> • Employment opportunities provided by ASM and economically linked activities (transport, workshops, merchants, shops, gem cutting, etc) • Income generation from ASM [desegregation as far as possible: at national level (relevance of ASM for foreign export balance and GDP), district -, local and individual level (typical household income)] • Identification of cross-sector effects and flows of economic resources across sectors; Quantification of inter-sectoral upstream linkages with local providers of goods and services and local development role of ASM, downstream linkages with manufacturing based on domestic minerals, creating aggregate value
Specific Issues:	
<i>Available Assets</i>	<ul style="list-style-type: none"> • Employment opportunities provided by ASM and economically linked activities (transport, workshops, merchants, shops, gem cutting, etc) • Income generation from ASM [desegregation as far as possible: at national level (relevance of ASM for foreign export balance and GDP), district -, local and individual level (typical household income)] • Identification of cross-sector effects and flows of economic resources across sectors; Quantification of inter-sectoral upstream linkages with local providers of goods and services and local development role of ASM, downstream linkages with manufacturing based on domestic minerals, creating aggregate value
<i>Vulnerabilities</i>	<ul style="list-style-type: none"> • Access to credit and dependencies from private creditors and money lenders; sometimes related with ownership of production facilities (equipment owner as “investor”) • Arbitrariness of prices for products, lacking market information systems or competitive buyers. • Linkages with criminal activities: Drug traffic, weapon traffic, money laundering, smuggling
<i>Structures and Processes</i>	<p><u>Transforming Structures</u></p> <ul style="list-style-type: none"> • Official credit lines for ASM, Mineral buyers, buyers organizations, money lenders • Fiscal authorities and market regulations <p><u>Formal Processes</u></p> <ul style="list-style-type: none"> • Linkages between fiscal policies and ASM: Direct taxes, fees and royalties, Indirect taxes, Sanctions in case of tax evasion, Benefits in case of compliance <p><u>Informal Processes</u></p> <ul style="list-style-type: none"> • Use of surplus income, alternative and traditional options for savings • Presence or absence of a culture of re-investment in the mine.

Social Capital

Social capital refers to “connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them” (Putnam, 2000). Formal and informal community-based organizations, social networks and traditional groups, as well as those networks specific to mining activities, can play an important role in the development potential of a community.

Particularly in the case of high unit value minerals, such as gold or diamonds, miners tend to work individually or in small groups. Due to fears of theft, the level of mistrust and risks of conflicts between miners can be high. In addition, the migratory nature of many ASM operations can prove a disruptive force in existing communities where miners have few connections in the local communities. Organization of miners is widely recognized as an important precursor to their legalization and the provision of support needed to facilitate improvements in ASM communities. The criteria to access financing, technical support and legal tenure often presents a major challenge for many miners, particularly if there exist barriers related to language, literacy, transportation to government offices, and mistrust towards government agencies. Organization of activities presents an opportunity for miners to share the burdens of these challenges.

Within ASM communities, non-mining organizations play a critical role in facilitating positive change related to a full spectrum of livelihoods. Other social support mechanisms, such as self-help practices to address the health services gap are further crucial in enhancing wellbeing.

Social Capital	
General Issues	<ul style="list-style-type: none"> • Overview of political context, governance, security, justice, human and democratic rights. • Description of institutional “landscape” and climate of relation between public and private sector • Description of quality and role of the formal social security system • Description of traditional hierarchical structures on regional and community level (role of chiefs, ...) • Description of typical “social contracts” within cultural norms, “regulating” informal property and informal safety nets
Specific Issues:	
<i>Available Assets</i>	<ul style="list-style-type: none"> • Existing organizational structures of ASM and their legitimacy or representation structures which might become stakeholders in ASM related programmes; Discussion of their relevance at different levels (community-level, “second floor” Chamber-type umbrella organizations); including informal organizations. • Internal micro-level organization schemes: Community and family context of ASM, gender roles within and related to ASM; Self-employment schemes (Ad-hoc groups, Cooperatives, Collectively or community owned firms) and Employer-employee schemes (Single-proprietorship firms, Corporations) • Public opinion about ASM (relevance to be evaluated on a case-by-case basis)
<i>Vulnerabilities</i>	<ul style="list-style-type: none"> • Inventory of existing conflicts (between rivaling ASM-groups, between miners and local communities, between ASM-miners and mining firms, etc) • Migration issues: Positive effect: Avoiding migration (Providing employment in rural areas); Negative effects: Promoting migration towards “boom towns”, disrupting local organization processes • Effectiveness of miners associations in representing ASM interests at government level
<i>Structures and Processes</i>	<p><u>Transforming Structures</u></p> <ul style="list-style-type: none"> • Analysis of public and private institutions (others than the sector related institutions analyzed in Natural Capital) interested in promoting an organized ASM sector • Applicability of existing PRSP’s to the ASM sector <p><u>Formal Processes</u></p> <ul style="list-style-type: none"> • Analysis if existing legislation promotes or obstructs the conformation of ASM organizations <p><u>Informal Processes</u></p> <ul style="list-style-type: none"> • Role and importance of informal safety nets, self-help initiatives, etc

Physical Capital

Physical assets include infrastructure (housing, roads, schools, clinics, etc) that contribute to or inhibit certain livelihoods.

In the context of ASM, mining equipment and its availability, use and appropriateness may or may not enable the best use of a mineral resource and may have extensive implications on the other capitals. Improved or ‘cleaner’ technologies may be more appropriate in many cases, although local perspectives on technological change and access to technologies alternatives should be considered. Lack of financing is often a main barrier to technology improvements, although amenability to technological change can be equally significant.

Within ASM regions, assets such as public infrastructure and housing conditions are equally significant in terms of non-mining livelihoods and overall health and wellbeing. For example, access to markets for mineral and non-mineral commodities is strongly reliant on decent roads. Access to

adequate health services strongly impacts health status and capacity to work. And access to schools provides an opportunity to improve socio-economic status and livelihood options through education.

The comparison between public physical assets in ASM communities compared to non-ASM communities should also be understood, where possible, as it provides insight into the degree to which ASM is marginalized from the mainstream (i.e. by governments).

Physical Capital	
General Issues:	<ul style="list-style-type: none"> Excerpt of relevant statistical data for physical infrastructure in rural areas (road, hospitals, health clinics, schools, etc.)
Specific Issues:	
<i>Available Assets</i>	<ul style="list-style-type: none"> Technology used in ASM and degree of mechanization, including assessment of suitability in terms of productivity and mineral recovery Average and minimum investment required for a typical production unit to improve productivity and mineral recovery Endowment of ASM communities with public infrastructure (roads, schools, medical facilities, drinking water, waste management, communication...); typical contribution of ASM to creation and maintenance of the infrastructure Typical housing of miner’s families (correlation between quality of houses and age or time-horizon of ASM activity indicating permanent or temporary nature of ASM)
<i>Vulnerabilities</i>	<ul style="list-style-type: none"> Reasons for “inappropriateness” of mining technology Continuity or discontinuity of services, vulnerability due to seasonal changes (transport during rainy season, water supply during dry season...) Proximity and access to basic services (health, schools, ...) Quality of services, responsibilities for maintenance
<i>Structures and Processes</i>	<p><u>Transforming Structures</u></p> <ul style="list-style-type: none"> Existence of investment promotion programmes (instruments for financing ASM equipment) Authorities on national, district and local level, in charge of basic infrastructure, <p><u>Formal Processes</u></p> <ul style="list-style-type: none"> Procedures for solicitation of public physical infrastructure, compliance of public officers with their duties (according to scope of ASM profiling). <p><u>Informal Processes</u></p> <ul style="list-style-type: none"> Attitudes towards technological changes or innovations Critical analysis of benefits of technological changes (benefited and affected groups) Culture of self-construction and appropriation of local public infrastructure by local population (user’s responsibility for maintenance)

(B) Benchmark Indicators

The second set of tools in the profiling kit involves benchmark indicators (Table 7). Suitable indicators should be simple to measure, reflect a more complex concept or situation, and enable comparisons across time and space. Indicators are invaluable tools for gauging progress.

Table 7: Benchmark Indicators
(Source: Noetstaller et al., 2004)

NATURAL CAPITAL INDICATORS	
National level	Community level
<p>Land use</p> <ul style="list-style-type: none"> • Arable land [% of land area] • Permanent cropland [% of land area] <p>Water</p> <ul style="list-style-type: none"> • Total freshwater resources [m³/capita] <p>Forests and Flora</p> <ul style="list-style-type: none"> • Forest area [% of total land area] • Average annual deforestation [%] • Higher plants species [number] <p>Fauna</p> <ul style="list-style-type: none"> • Mammals species [number] • Birds species [number] 	<p>Land use</p> <ul style="list-style-type: none"> • Arable land [% of land area] • Permanent cropland [% of land area] <p>Water</p> <ul style="list-style-type: none"> • Total freshwater resources [m³/capita] <p>Forests and Flora</p> <ul style="list-style-type: none"> • Forest area [% of total land area] • Average annual deforestation [%] • Higher plants species [number] <p>Fauna</p> <ul style="list-style-type: none"> • Mammals species [number] • Birds species [number] <p>Household ownership of land</p> <ul style="list-style-type: none"> • Share of households owning land [%] • Average size of land owned [ha/household]
HUMAN CAPITAL INDICATORS	
National level	Community level
<p>Population</p> <ul style="list-style-type: none"> • Total population [millions] • Females as percentage of labor force [%] • Children 10-14 in labor force [% of age group] <p>Health</p> <ul style="list-style-type: none"> • Physicians [per 1,000 people] • Life expectancy at birth [years] • Under-five mortality rate [per 1,000] • Prevalence of child malnutrition [% of children under 5] • Prevalence of HIV [% of adults] <ul style="list-style-type: none"> ○ Male ○ Female <p>Education</p> <ul style="list-style-type: none"> • Adult illiteracy rate [% ages 15 and over] <ul style="list-style-type: none"> ○ Male ○ Female • Primary completion rate [% of all children who complete primary school] <ul style="list-style-type: none"> ○ Male ○ Female • Average years of schooling <ul style="list-style-type: none"> ○ Male ○ Female 	<p>Population and labor force</p> <ul style="list-style-type: none"> • Total population of target area • ASM population in target area • Share of ASM population in target area [%] • Share of migrants in ASM population [%] • Females as percentage of labor force [%] • Children 10-14 in labor force [% of age group] • Children < 10 in labor force [% of age group] <p>Health</p> <ul style="list-style-type: none"> • Physicians [per 1,000 people] • Life expectancy at birth [years] • Under-five mortality rate [per 1,000] • Prevalence of child malnutrition [% of children under 5] • Prevalence of HIV [% of adults] <ul style="list-style-type: none"> ○ Male ○ Female <p>Education [male, female]</p> <ul style="list-style-type: none"> • Adult illiteracy rate [% ages 15 and over] • Primary completion rate [% of all children who complete primary school] • Average years of schooling

Table 7: Benchmark Indicators (cont...)

FINANCIAL CAPITAL INDICATORS	
National level	Community level
<p>Poverty</p> <ul style="list-style-type: none"> • Rural poverty rate [%] • Urban poverty rate [%] • Population below 1\$ a day [%] • Population below 2\$ a day [%] <p>Income</p> <ul style="list-style-type: none"> • Gross national income per capita [US\$] • PPP gross national income per capita [US\$] <p>Interest rates</p> <ul style="list-style-type: none"> • Deposit [%] • Lending [%] 	<p>Income</p> <ul style="list-style-type: none"> • Average household cash income from paid work [US\$/month or year] • Average household non-cash income from food production [US\$/month or year] • Number of persons per household • Total average income per person [US\$/person/year] <p>Expenditures</p> <ul style="list-style-type: none"> • Average household cash expenditures for food [US\$/month or year] • Average household cash expenditures for non-food [US\$/month or year] • Total average household cash expenditures [US\$/month or year] • Share of cash food budget in household income [%] <p>Savings</p> <ul style="list-style-type: none"> • Share of households owning savings in cash assets [%] • Value of savings in culturally relevant assets (e.g. cattle, jewelry) • Household savings rate [%]

SOCIAL CAPITAL INDICATORS	
National level	Community level
<p>Social security</p> <ul style="list-style-type: none"> • Public expenditures on pensions [% of GDP] • Average pension [% of per capita income] • Public expenditures on health [% of GDP] <p>Public safety</p> <ul style="list-style-type: none"> • Violent offenses [number per year per 100,000 population] • Property-related offenses [number per year per 100,000 population] 	<p>Social security</p> <p>Participation in formal safety net</p> <ul style="list-style-type: none"> • People with health insurance [%] • People entitled to unemployment benefits [%] • People entitled to receive pensions [%] • Average pension [% of per capita income] <p>Social networks</p> <p>Share of people with links to</p> <ul style="list-style-type: none"> • Occupation-based associations [%] • Community-based social assistance groups [%] • Informal savings and credit groups [%] <p>Public safety</p> <ul style="list-style-type: none"> • Violent offenses [number per year per 100,000 population] • Property-related offenses [number per year per 100,000 population]

Table 7: Benchmark Indicators (cont...)

PHYSICAL CAPITAL INDICATORS	
National level	Community level
<p>Population access to services</p> <ul style="list-style-type: none"> • Hospital beds [per 1,000 people] • Access to improved water source [% of population] • Access to improved sanitation facilities [% of population] <p>Households with access to services</p> <ul style="list-style-type: none"> • Access to potable water [%] • Sewerage connection [%] • Electricity [%] • Telephone [%] <p>Transport and information assets</p> <ul style="list-style-type: none"> • Passenger cars [per 1,000 people] • Two-wheelers [per 1,000 people] • Radios [per 1,000 people] • Television [per 1,000 people] 	<p>Population access to services</p> <ul style="list-style-type: none"> • Hospital beds [per 1,000 people] • Access to improved water source [% of population] • Access to improved sanitation facilities [% of population] <p>Ownership of assets:</p> <ul style="list-style-type: none"> • Share of households owning home [%] <ul style="list-style-type: none"> ○ Average size of home [m²] ○ With piped water in house [%] ○ With sewerage connection [%] ○ With electricity [%] ○ With telephone [%] • Share of households owning <ul style="list-style-type: none"> ○ Passenger cars [%] ○ Two-wheelers [%] ○ Motor boat [%] • Share of households owning <ul style="list-style-type: none"> ○ Radio [%] ○ Television [%] ○ Refrigerator [%]
ASM OPERATION LEVEL INDICATORS	
<p>ASM sub-sector size and structure</p> <ul style="list-style-type: none"> • Mineral production by ASM [time-series] • Total production units in target area • Average number of workers per production unit [number] • Share of production units organized as <ul style="list-style-type: none"> ○ Ad hoc groups [%] ○ Single proprietorship firms [%] ○ Co-operatives [%] ○ Partnerships [%] <p>Institutional performance</p> <ul style="list-style-type: none"> • Average duration of licensing process [weeks] • Licensing costs [US\$/licence] • Number of pending licence applications • Mine site inspections [number/year] • Number of conflicts between [per year] <ul style="list-style-type: none"> ○ ASM and large-scale mines ○ ASM and communities <p>Natural Capital</p> <p>Mining rights:</p> <ul style="list-style-type: none"> • Share of production units with mining licence [%] • Share of production units with proved mineral reserves [%] <p>Environmental effects:</p> <ul style="list-style-type: none"> • Area affected by ASM in target area [hectares] • Annual land degradation by ASM [hectares/year] • Annual land rehabilitation by ASM [hectares/year] • Use of mercury in ASM [kg/year] 	<p>Human capital</p> <p>Health:</p> <ul style="list-style-type: none"> • Lost workdays of ASM due to illness [days] • Lost days of other ASM household members due to own or child illness [days] <p>Mine safety:</p> <ul style="list-style-type: none"> • Protective equipment [US\$ book value/production unit] • Number of lethal accidents [per ASM district] • Lost workdays due to mine accidents [days/year/capita] <p>Financial capital</p> <p>Income</p> <ul style="list-style-type: none"> • Average income from mining [US\$/month or year] <ul style="list-style-type: none"> ○ Mine worker ○ Gang leader / shift boss ○ Licence holder ○ Property owner <p>Access to credit</p> <ul style="list-style-type: none"> • Share of production units with bank loan [%] <p>Social capital</p> <ul style="list-style-type: none"> • Share of miners with membership in ASM association [%] • Share of miners with membership in labor union [%] <p>Physical capital</p> <p>Mine assets owned per production unit:</p> <ul style="list-style-type: none"> • Mining equipment [US\$ per production unit] • Processing equipment [US\$ per production unit] • Transport equipment [US\$ per production unit] <p>Operational efficiency:</p> <ul style="list-style-type: none"> • Labor productivity [units product/day worked] • Mineral recovery [%]

(C) Methodological Guidelines

A range of data collection methods can be used to collect ASM Profiling data. These include:

- *Secondary Data:* Information and statistics found in reports, statistical yearbooks, and unpublished documents from governments, non-governmental organizations, academia and international institutions;
- *Key Informants:* Formal or informal interviews with people who have specialized knowledge of a subject;
- *Household Surveys:* A structured survey given to all or representatives of households. These usually provide information on household demographics, economics and livelihoods;
- *Village Surveys:* A survey comprised of closed-ended, and usually quantitative, questions. It usually focuses on village-level conditions and issues;
- *Focus Groups:* Usually undertaken separately with different interest groups, these are facilitated meetings that yield qualitative information on a topic of interest;
- *Participatory Methods:* Community members are involved in the design, collection and analysis of data. Key methods include: stakeholder analysis, resource mapping, and seasonal calendars.

Each method may be applicable under different circumstances. Noetstaller et al. (2004) has recommended the following (Table 8):

Table 8: Applicability of Specific Methods
(Source: Noetstaller et al., 2004)

	Secondary data	Key Informants	Participatory methods	Household surveys	Village surveys	Focus groups
Natural capital						
Available assets						
Vulnerabilities						
Structures and processes						
Social capital						
Available assets						
Vulnerabilities						
Structures and processes						
Financial capital						
Available assets						
Vulnerabilities						
Structures and processes						
Human capital						
Available assets						
Vulnerabilities						
Structures and processes						
Physical capital						
Available assets						
Vulnerabilities						
Structures and processes						

Factors such as data validity, reliability and generalizability across time and space should be considered throughout baseline profiling design, data collection and analysis. Data recording, compilation and reporting should be a systematic and well designed process.

10.3 Next Steps in ASM Profiling

The Toolkit for Baseline Profiling of ASM in Africa provides an invaluable framework for systematic comparison between ASM communities and a means to gauge project and policy performance over time. Although focused primarily on the African context, many components of the toolkit – its checklist, indicators and methodological guidelines – offers a starting point which is suitable for adaptation around the world. Many country- and community-level issues may require additional elaboration; thus the toolkit further provides detailed suggestions of potentially relevant issues.

As the summary presented herein provides only a glimpse into the guidance provided through the Toolkit, it is strongly recommended that any potential users intensively review the Toolkit in its entirety (see www.casmsite.org). In particular, collection of additional information – an enhanced understanding – may be warranted for many key issues. The Toolkit’s list of “Potentially Relevant Issues” provides further guidance in this regard.

The Toolkit for Baseline Profiling of ASM presents a tremendous opportunity for the international community. It is a chance to methodically collect data that aids in understanding the constraints and opportunities for the development of sustainable livelihoods in ASM communities, thereby supporting the contribution of ASM to human development in general. The decision by international organizations, governments, NGOs and others to use this tool symbolizes an important step towards making the vision of sustainable livelihoods a reality.

11 CONCLUSIONS

The artisanal and small-scale mining workforce has been estimated at more than 13 million, with in excess of 100 million people dependent on the sector for their livelihood. With escalating poverty due to factors including drought, conflict and diseases such as HIV/AIDS, combined with escalating commodity prices, the number of artisanal and small-scale miners continues to rise.

In addition to rural employment, ASM contributes to foreign exchange earnings, reduces rural-urban migration and enables the exploitation of deposits which are unattractive to formal mining companies. It further provides much-needed construction materials to burgeoning populations and has tremendous potential to support rural economic development. Conversely, ASM can result in a host of negative impacts to ecosystems and community livelihoods ranging from the destruction of agricultural lands, siltation of waterways, deforestation and serious occupational health risks to alcoholism, prostitution, violence and child labour. Furthermore, ASM often “breaks the promise” of riches, perpetuating the ASM poverty cycle through factors including inefficient mining practices and low productivity, unjust or unavailable markets for mined products, insecure land tenure and ill health.

The critical challenge for the global community is to mitigate the negative consequences and enhance the positive benefits of ASM in order to transform it into an activity which reduces poverty by supporting integrated sustainable development. As presented at CASM AGMs and Learning Events, considerable progress has been made on a number of fronts. Notable achievements include:

- Comprehensive strategies to counter the environmental impacts of ASM, including threats to biodiversity, through efficient, appropriate technologies and training, support for legalization, awareness campaigns and linkages with fair market access and financing mechanisms;
- Substantial progress in understanding the impacts of mercury misuse in gold mining and ways to mitigate it;
- Frequent integration of awareness and training campaigns into environmental and human health assessments;
- Development of training materials (mostly country and context specific) on appropriate technologies, occupational health and safety, environmental management, mine reclamation, and financial management;
- Implementation of “integrated policy and practice” models by a handful of international institutions and governments. Strategy components generally include policy reform, measures to increase transparency, support for formalization through extension services and other incentives, and provision of funding mechanisms;
- Local, national and international efforts to address conflict diamonds;
- Numerous examples of value-added and economic diversification opportunities;

- Recognition of the extent and nature of child labour and a commitment to rid ASM of this unacceptable activity;
- Models for mutually beneficial partnerships between large-scale mining and ASM; and
- Development of a “baseline profiling toolkit” to promote systematic and comprehensive assessment and monitoring of ASM and its interconnection with other livelihoods.

These accomplishments affirm that the knowledge, capacity and will exist to respond proactively to the needs of miners and their communities, overcome the hurdles to positive change and support integrated rural development. *Widespread dissemination of the lessons learned from these efforts and intensive global campaigns to build on these good works are now needed.*

The way forward for CASM and the international community centres on expanding these promising activities on a massive scale and affording additional attention to a number of key challenges. By overcoming these challenges, a wide range of broader development goals will also be advanced, marking important steps towards the reduction of rural poverty. This will require a global coordinated effort and firm commitments from donors, development agencies, government (including Ministries of Finance, Education, Health, and Public Works, to name a few), as well as local governments and organizations, such as CBOs and NGOs.

The advancement of ASM is closely aligned with many of the Millennium Development Goals (MDGs) and speaks directly to the agendas and mandates of many development organizations, donors and government agencies. To demonstrate these linkages, the principal areas where progress in ASM would support multiple development objectives have been structured around the MDGs, as follows:

MDG 1: Eradicate Extreme Hunger and Poverty

The poverty reducing potential of ASM is significant. As a non-agricultural rural livelihood with remarkable opportunities to sustain many spin-off livelihoods and generate related benefits, ASM has considerable capacity to catalyse integrated rural development. Poverty reduction measures needed to facilitate this change include the explicit incorporation of ASM into poverty reduction efforts, economic diversification of ASM communities, increased attention to the industrial minerals sub-sector and its downstream value-addition, and improved access to financing and fair markets.

Embedding ASM within Poverty Reduction and Rural Development Agendas

The alleviation of poverty has become one of the main objectives of ASM interventions. The formal inclusion of ASM into local, regional and national development programmes and Poverty Reduction Strategies (PRSs) are a means: to ensure that ASM initiatives explicitly serve these efforts; to leverage support from other sectors; to access HIPC and donor funds; and to advance developmental and poverty reduction objectives on the ground.

Although rural development has traditionally been associated with agriculture, current practice recognizes that sustainable development hinges on *integrated*

rural development, which necessitates identifying and building on traditional networks and institutions related to agriculture *and* other sectors. The ASM Profiling Guidelines provide some insight into how linkages between mining and other rural livelihoods can be understood. However, genuine on-the-ground projects and programmes to cultivate these interconnections are essential. Mechanisms to monitor change and measure progress in transforming enclave ASM communities into sustainable and resilient communities are further needed to ensure that efforts are effective.

Advancing integrated rural development and rural poverty reduction will require strategic thinking, access to relevant information, dedication of adequate resources to strengthening relationships with other sectors, and building the capacity of traditional ASM authorities and experts to nurture and participate effectively in multi-sectoral development initiatives. The objectives of existing development and poverty reduction initiatives frequently overlap with the challenges facing ASM, providing a valuable entry point. Mining ministries and other ASM stakeholders should actively engage in the sensitization of “non-mining” authorities and organizations with the objective of establishing formal commitments and partnerships. In most countries, integrated rural development is being encouraged at local, regional and national levels. ASM stakeholders must proactively merge with these endeavours and, in their absence, drive new integrated rural development initiatives forward.

Adding Value and Diversifying Economies

The role of ASM in advancing mining and non-mining livelihoods is a key determinant of the sector’s capacity to support poverty reduction. In recent years, the development of value-added processes and economic diversification has become a key component of a growing number of ASM efforts. In many cases, intra- and cross-sectoral livelihood development requires creative thinking. Coordination between sectors can yield a number of opportunities, including fish farms in flooded pits and using “rocks for crops”. Considering the seasonal nature of farming activities, numerous synergies exist where ASM can supplement other rural activities.

“Micro-cluster” development shows promise in many situations, although considerable support is needed in terms of training and equipment for lateral and downstream activities, provision of necessary infrastructure, improved relationships between authorities, miners and other sector stakeholders, and appropriate systems of taxation. Explicit support for these “innovation nuclei”, particularly where linkages with other sectors already exist, should become central to sustainable livelihood development in the ASM sector.

Through ministries of industry and finance, investment authorities, NGOs and international agencies, most countries already have active support programmes in place for the development of small and medium enterprises (SMEs). In addition to providing direct support for on-the-ground economic diversification efforts, the ASM community would benefit tremendously from undertaking an inventory of SME initiatives in their jurisdictions and linking these programmes with miners and their communities.

A critical precursor for the design of appropriate livelihood diversification strategies is a solid understanding of the strengths and vulnerabilities of the broader ASM community, its reliance on other economic activities and the opportunities for its advancement. Based on DFID's Sustainable Livelihood Approach, the ASM Baseline Profiling Toolkit provides sound guidance in this regard. Developing this understanding necessitates strengthened relationships between the government agencies in multiple sectors at local, regional and national levels, mining companies, artisanal and small-scale miners, mining-affected communities, development organizations, CBOs and NGOs. Establishing these key linkages further provides a vehicle by which ASM can be incorporated within integrated development programmes. These endeavours should consider the economic development potential on a regional level.

Building on Industrial Minerals

Although statistics on ASM employment frequently overlook industrial mineral miners, construction industry demands likely sustain the largest number of miners (including the highest percentage of women) of any commodities. Markets are often available in close proximity to mine sites, numerous lateral and downstream opportunities exist and the social challenges frequently associated with high unit value commodities (e.g. rushes, conflict) are rarely observed. Thus, industrial minerals are believed to hold considerable promise as important contributors to sustainable development. As the source of construction and building materials, industrial minerals support the development of housing and public infrastructure (roads, schools, clinics etc), providing much needed employment in the process.

Industrial minerals can further make an important contribution to food security. Soil fertility is on the decline in many agriculture dependent regions and many "agro-minerals", including phosphate, nitrogen and potassium salts, limestone, vermiculite and perlite, can significantly improve agricultural productivity, thereby improving food security.

In order to realize the potential of the industrial minerals sub-sector, the full spectrum of issues requires attention. These include: enumeration of miners, adequate consideration of legal frameworks, inclusion in technology assistance and extension services programmes, occupational health and safety, empowerment of women, elimination of child labour and exploration of value-added and economic diversification opportunities.

Financing Positive Change

Lack of access to finance is one of the key constraints to the development of the ASM sector. Without adequate funds, miners have little opportunity to improve their productivity. Without established mineral reserves, miners have little chance to access funds. Even if financing were available, the distance to bank branches, complex application procedures and difficulty to pay back money borrowed for failed ventures are major barriers.

Comprehensive assessments of potential financing opportunities and intensive support for the determination of mineral reserves, combined with efforts to connect miners with funding sources (e.g. multi-stakeholder events, ASM fairs), can be an effective means to bridge this gap. Third party guarantors,

such as NGOs who can provide additional financial management support, may provide a means to obtain commitments from financial institutions. Implementation of insurance schemes (to protect both lenders and beneficiaries) are core components. In order to advance integrated rural development, simultaneous support for non-mining livelihoods should also be included in efforts to improve financing access.

Financing alternatives include: loan-based schemes (e.g. microcredit), equity-based schemes, hire-purchase schemes, partnerships with large-scale miners, buyer credit schemes, granting facilities, and community-driven funding programmes. Access to sustainable sources of financing requires a paradigm shift in thinking on the part of financial institutions, government agencies and other potential financing sources. Management, bookkeeping and entrepreneurial skills should be further developed in miners and other ASM community residents.

Taking into consideration that ASM is a step towards cash economy, the saving and productive investment capacity of the miners should be stimulated. In other words, miners have a disposable income which should be put to work. It is my view that this area needs further attention

Even when miners access the funds needed to upgrade technologies and augment ASM revenues, whether these increased incomes contribute to wellbeing at a household or community level remains a contentious issue. Stimulating the savings and productive investment capacity of miners is an issue that warrants further attention. Ascertaining how to translate revenues derived from mining into positive development outcomes is a major challenge for miners, their families, their communities and other ASM stakeholders.

Marketing the Goods

The marketing of ASM products typically originates at the mine, being passed through a series of buyers who ultimately sell the product to a dealer for local consumption or export. Typically, the greater the number of intermediaries, the smaller the profit for the artisanal or small-scale miner. As many miners are working in remote locations with little access to or knowledge of outside markets, and this arrangement provides steady cash flow (provided production is also steady), unfair market prices persist. The nominal prices paid to miners exacerbate the low incomes and poverty that pervade the ASM sector. The multiple parties in the “commodity chain” who benefit from the status quo – illegality, lack of awareness and inadequate access to fair markets – are a major barrier to overcoming this hurdle. Efforts to create incentives to stem exploitative marketing structures and penalties for its perpetuation are critically needed.

Linking miners to local markets, formalizing mineral buyers, increasing awareness of international market prices (e.g. through marketing centres) and instituting creative purchasing arrangements (e.g. gem fairs) are means to improve access to fair markets. Fair trade initiatives also shows tremendous potential as an alternative to current mineral trade arrangements and can be an incentive for better ASM practices. Furthermore, programmes to assist rural populations in strengthening market access for a range of products are functioning in many countries – establishing linkages with these endeavours,

founded on the shared objective of rural poverty reduction, can serve to advance this issue further.

MDG 2: Achieve Universal Primary Education

More than one million children are currently engaged in ASM throughout the world. Work in ASM typically equates to a denial of a child's right to education. In many cases, from Peru to Tanzania to Papua New Guinea, children do not attend school mainly as a result of the associated expenses and loss of family income.

Classified as a "Worst Form of Child Labour" by the ILO, the International Programme on the Elimination of Child Labour (IPEC) provides an integrated strategy to counter child labour in ASM. A core component of this approach – which has achieved remarkable results in 16 countries throughout the world – has been to shift children from mine to school. With efforts including the construction of "transition schools", awareness campaigns targeting parents, teachers and local governments, and microenterprise support for women, the success of the IPEC approach serves as an invaluable model.

On the World Day Against Child Labour on June 8, 2005, fifteen countries along with representatives of the mining industry (ICMM), mining trade unions (IECM), and CASM promised to support the elimination of child labour in ASM by 2015. The achievement of this goal will require rolling out of the IPEC model to other jurisdictions through firm commitments from local, regional and national governments, partnerships with donors, development agencies, mining companies, NGOs and communities.

Child labour in ASM is clearly a significant barrier to achieving universal primary education. Numerous IPEC partnership projects have demonstrated that the elimination of child labour in ASM is an attainable goal. It is also cost effective. Forging global, national and local partnerships to realize this goal will advance not only the elimination of child labour, but achievement of MDG 2 and human development in general.

MDG 3: Promote Gender Equity and Empower Women

The MDGs obligate signatory governments to promote gender equity and the empowerment of women - a number of policies and programmes have been developed accordingly. Policy, however, is not the same as practice. Although the links between gender equity and human development are well-established, the commitment to gender mainstreaming in ASM interventions and government agencies – particularly mining ministries - including appropriate recognition of women in policy frameworks, has yet to be demonstrated.

Key opportunities for improvement include: formal recognition of the gender-differentiated impacts and benefits of the sector; authentic gender mainstreaming in technical assistance and ASM community development programmes; gender sensitivity training of mining authorities; undertaking gender audits of ASM projects; implementing programmes that provide financing and training for women; supporting alternative livelihoods for women; and promoting the education of girls as well as boys in ASM communities. The integration of ASM into existing efforts to support the

empowerment of women and gender equity will accelerate progress towards achievement of this goal.

MDG 4: Reduce Child Mortality

Child mortality strongly depends on maternal health, nutrient deficiency, environmental contamination, injury and the availability of decent health services. ASM communities are often characterized by inadequate public services, poor hygiene, deficient housing conditions and degraded environments. In many cases, poverty is extreme and food security is compromised. Child labour further increases the risk of death and injury. Diseases such as malaria, HIV/AIDS, tuberculosis, influenza and cholera, as well as malnutrition of children, are frequently reported in ASM communities. This situation is further exacerbated by the marginalization of the sector – attributed in part to the illegality and remote nature of these activities – by governments and mainstream society, resulting in poor infrastructure and public services. Children in ASM communities constitute a highly vulnerable group within rural populations. The absence of maternal supervision increases this vulnerability further.

Reducing child mortality in rural areas necessitates the inclusion of ASM communities in schemes to provide adequate public health services, improving maternal health, clean water and basic sanitation. It further hinges on improved environmental performance of ASM, eradication of child labour and rural economic development. Appealing to Ministries of Health, Development, and Environment, as well as local governments, donors and development organizations, including the WHO, will be necessary to reduce child mortality in rural areas, including children in high risk ASM communities.

MDG 5: Improve Maternal Health

With women predominantly engaged in the mineral processing aspect of ASM, including crushing of silica-bearing rock and the use of mercury during gold mining, combined with poor public services and high risks of HIV/AIDS, malaria and other diseases, the health status of women in ASM communities during pregnancy, delivery, post-partum is often gravely compromised.

Improving maternal health in ASM communities requires explicit enhancement of public health services, empowerment of women, provision of improved livelihood alternatives for women, gender equity in education, countering of communicable diseases such as HIV/AIDS and malaria, and mitigation of the occupational health risks (such as silicosis) faced by women miners. Furthermore, as it is a serious developmental toxicant, mercury reduction efforts warrant special consideration.

A key determinant of the vulnerability of women to HIV/AIDS, other STDs and other diseases and illnesses is their status. Thus, campaigns to improve the status of women are critical to mitigating these health challenges. These issues are naturally aligned with initiatives to promote maternal health and should provide a doorway to leveraging support from instituting agencies and organizations.

MDG 6: Combat HIV/AIDS, malaria and other diseases

Serious illness is one of the major determinants of poverty. Due to the migratory nature of ASM, often including an active sex trade and high risk practices, HIV/AIDS in ASM communities can be particularly prevalent. In addition, as the potential for malaria is exacerbated by flooding and the generation of standing water, for instance in abandoned pits, malaria is frequently cited by miners and their communities as a primary health concern. Transmission of other diseases, such as cholera, is aggravated by poor sanitation and hygiene. It is not surprising that in ASM communities throughout the world, diseases such as HIV/AIDS, malaria, silicosis and tuberculosis have been reported as dominant causes of morbidity and mortality.

Combating HIV/AIDS, malaria and other diseases in rural areas will be advanced through efforts in ASM communities including: provision of sustainable livelihood alternatives to women engaged in the sex trade; reducing migration by identifying viable mineral reserves and alternative livelihoods, as well as improving access to land tenure; supporting reclamation and enhanced mine waste management practices; sensitizing rural populations on community health risks and protective measures; and improving public services and hygiene practices.

Realizing the significant rural poverty reduction potential of ASM relies on the health status of ASM communities. Reducing susceptibility to HIV/AIDS, malaria and other diseases will require a concerted effort to bring existing community health programmes to ASM communities. These include awareness campaigns, sensitizations efforts, health service initiatives and interventions. As rural ASM populations are highly vulnerable to both HIV/AIDS and malaria, support must be solicited from organizations and agencies that are well-equipped to respond effectively to these critical health issues.

MDG 7: Ensure Environmental Sustainability

Threats to environmental sustainability from ASM included siltation of waterways, deforestation, mercury and cyanide pollution, and agricultural lands. It further contributes to loss of habitat and increased poaching, in some cases increasing threats to biodiversity. The environmental impacts of poor ASM practices are well understood and the body of knowledge on 'cleaner' intermediate technologies is impressive. Nevertheless, resources continue to be predominantly allocated towards characterizing – rather than countering – the environmental impacts of ASM.

There is a dire need for concentrated efforts on capacity building of miners, intensive promotion of appropriate technologies (coupled with funding and other mechanisms supporting their use), development of mine waste management solutions (e.g. tailings impoundments), mine reclamation, low-cost methods for remediation of contaminated sites and integrated approaches to biodiversity protection.

Assuring environmental sustainability will require massive campaigns to facilitate these measures – current resources are insufficient. Increasing the

visibility of ASM within organizations such as UNEP, donor environment departments and programmes, environmental agencies in governments and NGOs is an important precursor to generating the attention and resources required.

MDG 8: Develop a Global Partnership for Development

Partnerships forged by a shared vision for development have outstanding capacity to address the multi-faceted challenges facing ASM, thereby transforming it into an activity which effectively supports rural poverty reduction. Not only miners and their communities, but all stakeholders currently engaged in the ASM dialogue – from CASM, government, and academia to NGOs, international institutions and mining companies – are interconnected through their collective commitment to the advancement of ASM. In order to realize the full development potential of ASM, however, the network must be expanded. Engagement of a wide range of donors, development agencies, governments and others is crucial.

Forging Strong Global Partnerships

The challenges facing the ASM sector readily coincide with existing efforts related to a range of issues, including rural economic diversification, market development, HIV/AIDS, governance, conflict and the empowerment of women, to name a few. These issues can serve as entry points by which partnerships can be built and ASM can be integrated into associated agendas. Fostering essential partnerships and developing substantive commitments requires the identification of issues which cut across priorities of ASM and other sectors through institutional and regulatory frameworks, existing programmes and initiatives and the mandates of multiple organizations.

ASM advocates must actively sensitize the broader development community on these linkages and identify mechanisms by which to pursue mutual development objectives. Within other agencies and institutions, “champions”, are needed to advance specific issues within their organizations and communities through both inclusion in their portfolios and raising awareness of the significance of ASM to a broad range of developmental objectives.

At the heart of global partnerships are communities. In addition to building linkages with national and international agencies and institutions, ASM communities must be included under the umbrella of global collaboration.

Development Driven by Communities

All communities possess assets and strengths – and the knowledge of what contributes to their own wellbeing – that are vital to creating positive change. Community-driven development (CDD) is founded on the principle that communities must not only have a voice in policies, projects and programmes that affect them but should be afforded more control in driving on-the-ground efforts.

Co-definition of project goals, clarity of roles and responsibilities, mechanisms for monitoring and measuring outcomes, access to information and sufficient support (in many cases from NGOs or CBOs) are key components. By giving resources and appropriate assistance to communities as project facilitators and partners, community-driven development has been shown to be an effective

means for women and men to meet their own needs and priorities. Decentralization efforts should afford local governments and communities with the support needed to empower CBOs and local service providers to effectively advance community-driven development.

Partnerships between communities and NGOs, the private sector, local governments, and development agencies can be established through participatory development approaches. These generally involve close collaboration between communities and instituting organizations, knowledge sharing and mutual education, and the objective of affecting positive change. Participatory approaches have the capacity to increase the voice of communities in identifying relevant issues; undertake work that better responds to community needs; encourage skills and knowledge building by both communities and project facilitators; support cultural appropriateness; and strengthen relationships between communities and participating organizations and institutions. These approaches have further been demonstrated as an effective means to generate innovation and ownership and increase the likelihood of sustained action.

Despite the potential advantages, community-driven and participatory development is infrequently included in the ASM discourse. Sharing of lessons learned in instituting these approaches, combined with strengthening of the capacity of ASM stakeholders to incorporate this into policies, projects and programmes is vital to achieving the human development objectives of ASM initiatives.

In the few community-based ASM efforts that have explicitly adopted participatory approaches, youth are notably absent from the process. Facilitating the changes needed in ASM is undoubtedly a lengthy process that requires ongoing commitment from all parties. As such, the strengths, needs and opportunities of youth – as well as adult women and men – should also be entrenched in participatory development approaches and any ASM initiative in general.

The Future of CASM

Improving the technical, environmental, economic and social performance of ASM and realizing its full poverty reduction potential calls for a global coordinated effort. With intense competition for existing development funds, a compelling case must be made for both the establishment of new partnerships and the expansion of current initiatives. A critical launching point for ASM advocates is the alignment of ASM with the Millennium Development Goals, thereby speaking directly to the agendas and mandates of many development organizations, donors and government agencies.

In addition to CASM's roles as knowledge sharer and developer, project implementer and peer supporter, its importance as a network builder is growing. Persistently low awareness of ASM and its multifaceted influence on rural communities can be countered through concerted advocacy. As a credible ASM umbrella organization with an extensive and expanding network of dedicated members, CASM is well-positioned to increase the visibility of ASM and galvanize strategic partnerships and commitments in order to realize the prospective contribution of ASM to a wide range of development objectives.

A clear path for the way forward is emerging and all ASM stakeholders must play their part. Individually, these parties lack the resources needed to solve all challenges facing the ASM sector. However, united in these endeavours and with the engagement of the broader global community, the skills, commitment and resources of all stakeholders will enable CASM to achieve its primary mission – *to reduce poverty by supporting integrated sustainable development of communities impacted by or dependent on the ASM sector.*

12 THE WAY FORWARD

The challenges facing the ASM sector are immense in scale and complexity but far from insurmountable. By sharing the wealth of knowledge and experience derived from CASM AGMs and Learning Events, considerable insight can be provided to all those working to advance the sector and thereby reduce rural poverty. CASM events, coupled with a host of international initiatives provide practical guidance on what can and should be undertaken and provide the basis for the development of a new vision for ASM. Hallmark programmes include, but are not limited to, the Mining, Minerals and Sustainable Development Initiative (MMSD), the Extractive Industries Review (EIR), Agenda 21, and a CASM sponsored conference on the Millennium Development Goals and Small Scale Mining.

In 2002, the Yaoundé Seminar on Small Scale Mining provided a clear direction for future ASM efforts (Appendix One). Representing the culmination of a three year project, the Yaoundé Seminar sought to "develop an understanding of poverty in artisanal mining communities and the role that the sustainable livelihood approach can play in eradicating poverty in these communities".

Key issues put forth at Yaoundé include increased focus on alternative livelihoods, improved regulatory frameworks, an enhanced network of support services, improved capacity of miners, and the provision of affordable and appropriate technology options.

Consensus was achieved on the need to implement a number of strategies, including the following (Pedro, 2003):

- Acknowledgement of ASM sectoral issues in national legislation and codes;
- Mainstreaming of poverty reduction strategies into mining policy;
- Integration of ASM policy into Poverty Reduction Strategy Papers (PRSPs) with linkages to other rural sectors;
- Development of a strategic framework for PRSPs;
- Review of existing thinking on ASM policies and legislation, and undertaking necessary reforms of the ASM sector (e.g. traditional land rights, modern land use legislation);
- Improvement of policies, institutions, processes and ASM stakeholders' livelihoods;
- Establishment of an HIV/AIDS and ASM working group; and
- Development of partnerships in order to promote sustainable use of natural resources, infrastructure development and land use management.

This guidance for CASM, governments, NGOs, international organizations and other stakeholders, in conjunction with findings from CASM Events and other international initiatives, provides a solid foundation for the way forward.

12.1 Miners and Communities

When people actively work to construct the community they desire, it becomes a place worth struggling to preserve and develop. Miners and communities affected by ASM have a critical role in creating their own futures and, as is the case for all ASM stakeholders, are also accountable for facilitating positive change. "Building community" requires empowerment, democratic credibility, appropriate action and, above all, buy-in at the community level. Communities are not only key partners in efforts to advance ASM, but should be drivers of human development through participation in decision-making, on-the-ground action and evaluation and monitoring.

In order for miners and ASM-affected communities to create the change they desire, they must co-define clear objectives and pathways for advancing their vision of community. Possible avenues may include the following:

- Development of community-based standards of practice regarding technology, safety, environment, gender equity and child labour as well as the implementation of related community-based monitoring;
- Pursuit of information, training and support from government agencies, Chambers of Mines, NGOs, mining companies and others;
- Advocacy for community needs, interests and opportunities by establishing links with key government agencies and NGOs;
- Support for transparency and reduced corruption by reporting transgressions to authorities;
- Lobbying of formal and informal leaders to recognize the significance of ASM and increase their role in advocating for the sector;
- Participation in local and regional programmes and development efforts;
- Encouragement for the voice of youth in community-based efforts; and
- Recognition of the significance of gender equity through inclusion of women as well as men in decision-making and ensuring equal access to, and control of, ASM-related and community assets (e.g. land, revenues, information).

Individuals frequently lack the time and other resources to implement many of these recommendations. The formation of organizations (associations, cooperatives, entrepreneurial ventures) by miners and communities can be an effective means to identify needs and capacity, lighten the load and access the necessary support. Sustainable and effective organizations require clear structure and purpose. Definition of goals and objectives and allocation of roles and responsibilities for organization members, for instance as chairpersons, representatives on local or regional planning committees and liaisons with government representatives (e.g. health officers, environment officers, mines inspectors) are key elements. Many NGOs and government programmes provide support for the development of community-based organizations and a first step may be seeking their assistance.

12.2 Governments

Political will is crucial to the advancement of ASM. Many government mining departments have taken steps to support formalization and incorporate ASM into mineral policy. However, only marginal progress has been made in terms

of placing ASM on the human development agenda. As the supervision and monitoring of the ASM sub-sector falls under the mandates of multiple government agencies – from issues ranging from occupational and community health and gender to infrastructure and environment to land use, water resource management and development – ASM advocates need a clear entry point to form a collaborative plan to advance the sector.

Recommendations for government policy and practice necessarily span the multiple facets of the ASM sector. It is recommended that governments actively advance the following:

ASM and Development

- Formalization of government commitment by *multiple* agencies to improved economic, environmental and social performance of ASM;
- Advocate inclusion of ASM within national budgets through collaboration between Ministries of Finance and other key Ministries (e.g. mining, health, labour, gender, social and economic development, infrastructure, environment, etc);
- Mainstreaming of ASM within poverty reduction and development strategies, including Poverty Reduction Strategy Papers (PRSPs);
- Formal collaboration with other sectors (manufacturing, trade, agriculture, forestry, water, health, education, etc) in order to embed ASM into rural development strategies and programmes;
- Enhancement of the profile of ASM through the sensitization of local, regional and national government officials, NGOs and other organizations;
- Encouragement of community involvement in mineral resource management and related economic diversification efforts, particularly using participatory approaches that involve women and men, adults and youth;
- Development of formal collaboration between mining and health ministries, as well and international agencies and NGOs to develop and implement a strategy for HIV/AIDS in ASM; and
- Mobilization of international (e.g. donor) support for the sector.

Policy Reform

- Develop mechanisms to curb discretionary supervision of mining activities, including strict monitoring and reporting standards;
- Evaluation of licensing requirements for miners as well as traders and buyers to provide streamlined procedures and reasonable fees;
- Ensuring transparency in the mineral title registry (i.e. first-come, first-serve) and increasing the access and the flow of information to miners;
- Levy and collection of reasonable royalties and taxes;
- Examination and reform of current policy and practice in order to facilitate gender mainstreaming and eliminate barriers to inequitable access and participation in ASM (e.g. related to land rights and the right to work);
- Development of a strategy and standards for the elimination of child labour;
- Collaboration with labour ministries to establish and enforce health and safety regulations specific to ASM;

- Collaboration between mining and environmental authorities to develop appropriate environmental regulations, monitoring and enforcement mechanisms;
- Inclusion of miners and other community stakeholders in policy development processes;
- Curb or eliminate smuggling or black market trade of minerals through vigilant monitoring, stiff penalties and provision of extension services (e.g. district buying centres); and
- In the case of countries with active gold mining, the institution of policies to regulate the sale and import of mercury, for instance, related to specific reporting requirements for its import or export.

Legalization, Formalization and Organization

- Allocation of resources required to support the formalization of the sector especially in relation to the provision of extension services;
- Creation of incentives for legalization, for instance related to provision of extension services and fair market access;
- Gender mainstreaming of formalization efforts, including extension service provision;
- Staffing of mining departments and extension offices with both women and men to promote gender equity in access to services; and
- Support the formation of ASM organizations including enterprise groups, associations and cooperatives.

Technical and Economic Performance

- Provision of training in appropriate technologies, mineral identification and resource estimation, financial management, environmental protection and occupational health and safety;
- Assist miners in conducting mineral reserve estimates and satisfying criteria for access to financing;
- Sensitization of miners on legal and regulatory requirements
- Support for technology improvements through partnerships with large-scale miners, encouraging local production of ASM equipment, demonstration projects and the establishment of training centers;
- Conducting an inventory of existing SME support programmes and sensitizing miners and communities about related opportunities;
- Promotion of access to financing mechanisms in association with formal institutions (domestic banks and microfinance), SME granting facilities, trust funds and community-based schemes;
- Support for fair market access by legalization, monitoring and enforcement of mineral commodity buyers, development of related incentives, and improving the flow of up-to-date market information to miners; and
- Establishment of linkages between miners and markets through collaboration with investment authorities, other government agencies (e.g. related to infrastructure projects or foreign activities), and registered buyers.

Environmental Management

- Increased awareness and access to environmentally-responsible methods through demonstration projects, training and education;

- Support for training of miners and other community members in environmental management and provision of related guidance, particularly in areas of intense ASM activities;
- Sensitization of miners on environmental legal and regulatory requirements;
- Provision of adequate resources to government officers for support, monitoring and enforcement;
- Formalization of collaboration between mining authorities, forest and environmental authorities, miners, communities and others to develop and implement strategies for ASM in biologically sensitive areas; and
- Support for community-based monitoring through environmental committees.

Social Performance

- Development of rush-response plans inclusive of on-site monitoring, infrastructure, community health and control measures;
- Formalization of collaboration between mining ministries and health, environment, planning, infrastructure and labour authorities (at national and local levels) to improve conditions and facilitate development in ASM communities;
- Co-identification and co-elimination of barriers to the empowerment of women working in conjunction with ASM communities;
- Implementation of integrated strategies to eliminate child labour in conjunction with community and international partners (e.g. ILO) and local and national governments;
- Allocation of resources to eliminate child labour in district/state and national government budgets;
- Implementation of mechanisms to ensure the fair distribution of mining benefits;
- Encouragement of community-based initiatives to monitor and improve the social and environmental performance of ASM;
- Support for the development of, and establishment of formal linkages with, community organizations (e.g. with key persons acting as a liaison); and
- Mitigation or prevention of conflicts associated with multiple land uses.

In order to bring these extensive recommendations into fruition, mining ministries should actively engage in the sensitization of “non-mining” authorities in order to develop formal commitments and partnerships. Many mining authorities themselves also often require additional training to facilitate the necessary improvements in the sector. In addition to traditional mining disciplines (e.g. mining and mineral process engineering), training may be required in occupational health and safety, environmental management, gender sensitivity, conflict resolution and participatory approaches.

Governments have a monumental task at hand. ASM must be embedded within the agendas of different government authorities and at various levels of government. The alignment of ASM efforts with the Millennium Development Goals will significantly move ASM higher on government agendas and will advance ASM sector improvements on-the-ground.

12.3 International Institutions and Agencies

As significant providers of technical, financial, and legal support, and as key drivers of human development, international institutions – including the World Bank, DFID, UN organizations and other development agencies, national geological surveys, mining centers and academic institutions – are imperative to improving the performance of the ASM sector and advancing its contribution to poverty reduction. Many of the recommendations put forth to governments, communities, organizations and individuals are beyond their grasp – lack of resources, awareness, capacity, and, in some cases, recognition for the significance of ASM, are key impediments. International institutions and agencies have a responsibility to break down these barriers to positive change.

Many of these organizations have specific mandates that are closely aligned with the work at hand and have actively engaged in the struggle to advance the ASM sector. These include ILO (working conditions, safety and health, child labour), UNIDO (ASM technology), UNECA (sustainable mineral development in Africa), and IDRC-MPRI (formalization of ASM in Latin America). Other institutions, such as the World Bank, DFID and BRGM, have taken a broad based approach to ASM, targeting multiple issues simultaneously. However, many organizations with specific capacities and interests, such as WHO, UNIFEM, UNEP and UNAIDS, as well as a plethora of donors with mandates overlapping the development objectives of ASM, should also be included in the ASM discourse.

Each international institution and agency has a role to play that varies with its resources, mandate, skills and abilities. In addition to efforts currently underway, it is broadly recommended that these organizations undertake the following:

- Formally acknowledge ASM as a major livelihood activity that, with the realization of key improvements, can effectively contribute to the reduction of poverty;
- Sensitize other key institutions and agencies currently not engaged in the ASM dialogue;
- Provide financial and/or technical support to governments to enact ASM appropriate laws and regulations, increase transparency, provide extension services to miners, build their own capacity through training, and integrate ASM into their existing development programmes;
- Promote and provide guidance to governments regarding the incorporation of ASM within national poverty reduction strategies;
- Facilitate and fund on-the-ground projects, particularly those which strengthen the capacity of communities to drive development and support the achievement of the MDGs and their self-identified needs and priorities;
- Resource and engage the support of non-governmental and community-based organizations in the implementation of on-the-ground projects;
- Aid communities in developing standards of practice and monitoring mechanisms for occupational and community health, environmental protection, child labour and gender equity;

- Ensure gender is mainstreamed within policies and programmes and undertake specific initiatives to support gender equity and the empowerment of women and girls in ASM communities;
- Support the creation of ASM training centers that build skills in mining and value-added processes;
- Provide training to miners on a range of key issues (technology, occupational health, community health, etc), including the identification and assessment of mineral reserves, a critical precursor to funding access;
- Undertake or fund national studies of available financing mechanisms for ASM and work to establish links between miners and financial institutions;
- Support the creation of funding mechanisms for ASM communities, such as the granting facilities, development trust funds and miners cooperative banks;
- Develop, use and disseminate mechanisms for monitoring, evaluation and measuring progress; and
- Support CASM in identifying and disseminating good practices.

In addition to these general issues, certain institutions and agencies should play a role – either independently or in collaboration – in responding to specific needs. For instance, in the case of gold mining, it is clear that the flow of mercury from industrialized and other countries to ASM activities in developing countries must be countered. In response to this, key organizations, such as UNEP and UNIDO, should:

- Increase government awareness (both in countries exporting mercury and those importing it) concerning the end-use of mercury in ASM;
- Support the institution of policies to regulate the sale and import of mercury. Regulations which identify mercury as a “restricted use hazardous substance” whose import or export demand specific reporting requirements are steps towards accomplishing this goal;
- Develop mechanisms to track mercury exports and increase transparency in the global mercury trade. The import/export notification put forth by the Rotterdam Convention’s Prior Informed Consent (PIC) procedure is one protocol which should be considered (Veiga et al., 2005).

HIV/AIDS is another area where international agencies and institutions can collaborate in tackling this major barrier to human wellbeing and development. This may include:

- Participation in an HIV/AIDS in ASM working group; and
- Coordination with governments, other implementing organizations (e.g. Health Ministries, NGOs, UNAIDS) and communities to include an HIV/AIDS component in projects and programmes; and
- Building their institutional capacities to understand how policies and programmes may be affected by HIV/AIDS and engaging appropriate expertise and partners as needed.

Integrated rural development models that are inclusive of ASM should also be brought to the forefront of ASM efforts. International agencies and institutions can play a pivotal role in advancing the successful integration of ASM within

rural, regional and national development strategies. In order to facilitate this, these organizations should:

- Sensitize members of their own organizations currently not engaged in the ASM dialogue;
- Develop collaboration within their own institutions in order to embed ASM in rural development programmes and initiatives;
- Advocate for the inclusion of ASM in integrated rural development programmes; and
- Implement on-the-ground integrated rural development projects in conjunction with stakeholders from a number of sectors, including mining, agriculture, fisheries, forestry, manufacturing, water, health and education.

It is strongly recommended that international agencies and institutions work with CASM and other stakeholders to ensure that efforts are coordinated in order to reduce redundancy and optimize results. A collaborative and harmonized approach will support appropriate allocation of resources and action that effectively respond to clear needs.

12.4 Non-governmental Organizations

With mandates ranging from human rights and environmental protection, dissemination of knowledge concerning both policy and practice and, in many cases, provision of key services, particularly at the community level, the importance of non-governmental organizations (NGOs) in advancing human development is growing. NGOs perform a wide array of functions targeting various facets of society. Ranging from international NGOs, whose activities may extend across continents, to health-based organizations (HBOs), who may be engaged in health service delivery on the ground, to grass-roots and community-based organizations (CBOs), NGOs have an important role to play in the advancement of ASM.

It is recommended that NGOs:

- Formally acknowledge ASM as a major livelihood activity that, with the realization of key improvements, can effectively contribute to the reduction of poverty;
- Actively engage with governments, international organizations and initiatives, companies and ASM communities; and
- Participate in ASM initiatives that are aligned with their individual capacities and mandates, for example related to strengthening community-based organizations, improving community health, capacity building and environmental protection.

Although representing the private sector, Chambers of Mines and mining associations – including mining trade unions – could be included under the broad NGO umbrella. They are, however, not “single-issue” NGOs. These representatives of formal mining could become effective drivers for positive change by:

- Lobbying for improved buying and selling arrangements;
- Monitoring unfair practices;
- Advocating the needs and interests of miners;

- Liaising between smaller ASM organizations and governments;
- Providing market information and facilitating training of miners;
- Aiding in the resolution of conflicts, for instance related to land use; and
- Encouraging their members (large-scale miners and their workers) to participate in training and provide support related to ASM technology, health and safety issues, mine reclamation, environmental management, the elimination of child labour and community development.

12.5 Mining Companies

Mining companies can play an important role in promoting sustainability of ASM communities and improving performance of the sector. Prompted by reports of invasions and violence from artisanal and small-scale miners, many companies have recognized that ASM represents a socio-political risk that must be considered through all phases of a project. With recognition that diplomacy can be far more effective than force, combined with increased commitments to corporate social responsibility and acknowledgement that much of civil society views “mining” as a somewhat homogeneous activity, the business case for mining companies to support advancement of ASM is strong.

In order to support ASM and ASM communities, it is recommended that mining companies, in conjunction with mining trade unions, where appropriate, actively pursue opportunities such as:

- Establishing formal partnerships with the ASM sector;
- Demarcating small zones inappropriate for large-scale extraction on mining leases (in conjunction with regulatory authorities);
- Providing financing (i.e. loans) for technical and other improvements;
- Assisting and training miners on a range of issues (e.g. occupational health, reclamation, mining methods; financial management, explosives management);
- Aiding miners in the determination of mineral reserves (combined with support for access to financing);
- Providing emergency response services;
- Availing processing services to miners;
- Liaising with government departments, NGOs and international agencies in efforts to obtain additional support;
- Providing guidance on marketing and commercialization;
- Assisting in the organization, formalization and legalization of miners;
- Proactively supporting alternative livelihoods, economic development and other improvements in ASM communities.
- Supporting the wider community by sourcing as many as possible of their requirements (goods and services) from it; and
- Making the elimination of child labour a condition of its engagement in the community.

National mining institutes and international organizations that serve the formal sector, such as the World Gold Council and the Canadian, Australian, and South African Institutes of Mining, can also play a role by:

- Formally acknowledging ASM as a major livelihood activity that, with the realization of key improvements, can effectively contribute to the reduction of poverty;
- Sensitizing constituents on the challenges facing the ASM sector;
- Encouraging large-scale miners to support ASM improvements;
- Placing ASM on the agenda of national and international meetings and conferences;
- Facilitating the exchange and dissemination of best practices and experiences in dealing and networking with ASM communities; and
- Supporting funding mechanisms (e.g. community development funds) targeting artisanal and small-scale miners and ASM communities.

12.6 CASM

In the early years of CASM, its primary focus was on networking between stakeholders, website and knowledge center development, and information exchange and learning. Although CASM has achieved success in these activities, at the 2003 CASM AGM in Ghana, there was a call for CASM to respond more directly to the needs of miners, communities and governments affected by ASM while contributing to higher level policy objectives.

In response to this, in January 2004 the Strategic Management and Advisory Group (SMAG) was established as an advisory group. It will play a critical role in charting a course for CASM and ensuring that CASM achieves its stated objectives. The 2004 CASM AGM in Sri Lanka echoed the call put forth in Ghana, but further stressed that “mining specific” issues, for instance related to mining methods and occupational health and safety, still require considerable attention (CASM, 2004).

While current ASM practices can generate serious environmental, economic and social problems, these challenges can and, indeed, must be mitigated through increased vigilance. As they form the core of the ASM poverty cycle, in order for CASM to become a more direct facilitator of community development, these issues must be addressed either by CASM directly or through increased advocacy both within and external to the CASM network. Additional recommendations identified at AGMs and other Learning Events, as well as those put forth by the SMAG, relate to CASMs roles as knowledge sharer and developer, network builder, project implementer and peer supporter. It is therefore recommended that CASM actively undertake the following over the next five years:

Knowledge Development and Sharing

- Provide ongoing support for learning events highlighting the multi-faceted issues and how they are being addressed throughout the world;
- Disseminate good practices and lessons learned from ASM projects and programmes.
- Develop guidance materials for formal inclusion of poverty reduction in national mineral development policies and, correspondingly, the incorporation of ASM into integrated development initiatives and poverty reduction strategies (e.g. PRSPs);

- Support the realization of the MDGs through the development of a related strategic framework for ASM. This should include:
 - Establishment of clear targets and benchmarks, inclusive of a schedule for their achievement;
 - Guidance material on the MDGs and ASM;
 - Sensitization of ASM stakeholders; and
 - Obtaining commitments to the MDGs from stakeholders.
- Promote community-driven development by building the knowledge of ASM stakeholders in ASM policies and programmes. Approaches should involve women as well as men and adults as well as youth;
- Develop guidance material for gender mainstreaming of government policies, ASM interventions and community-based efforts; and
- Sensitize ASM stakeholders on child labour issues and, working with network partners, advance a formal strategy for its elimination as a global action item.

Network Building

- Initiate a strategically coordinated global effort and mobilization of support from international agencies for ASM initiatives. This should include institutions currently on the periphery of the ASM dialogue (e.g. donors, UNIFEM, UNAIDS, Mineral Policy Center, and health, development and environment-focused NGOs);
- Support the integration of ASM within local, regional and national rural development strategies by drawing individuals and organizations from other sectors into the CASM network. This may include individuals and organizations from the agriculture, forestry, tourism, health, water and public infrastructure sectors;
- Increase awareness of ASM in multi-lateral agencies through advocacy;
- Develop a formal communication strategy and generate related materials for distribution to media outlets, donors, governments, development organizations and others;
- Facilitate the establishment of an HIV/AIDS in ASM Working Group; and
- Establish a “Yaoundé” communication network, linking the various stakeholders charged with action items at the Yaoundé Seminar.

Project Implementation

Project support should address a range of key issues including occupational health and safety, organization of miners, economic diversification, networking between ASM communities and collaboration with other sectors.

Clear targets and benchmarks for the achievement of multi-faceted human development goals – in particular related to the MDGs and integrated rural development - are also a key area where CASM can play a leadership role. Linkages between project support by CASM and advancement of these targets would provide a means to promote positive change.

CASM should:

- Support community-driven development through small grants initiatives;
- Provide an award to projects which advance the MDGs and integrated rural development through establishment of key partnerships and cooperation with other sectors;
- Support projects that address ASM “orphan sites”, in particular related to improvement of socio-economic conditions, environmental impacts and other legacy issues; and
- Develop and provide funding for partnerships with project implementers who are undertaking initiatives that support the achievement of the MDGs and integrated rural development.

Peer Support

- Provide a much-needed peer review mechanism for project monitoring and evaluation, equipped with clear measures of progress, via the extensive knowledge present in the CASM network, including that of the CASM Expert Advisory Group.

Developing partnerships with governments, NGOs, international development agencies mining companies and ASM communities will be critical to undertaking this work. CASM has the vision, commitment and resolve to become a more responsive and dynamic organization and a vehicle for transparency, good governance, economic vitality, and sustainability. However, the advancement of CASM’s primary mission – *to reduce poverty by supporting integrated sustainable development of communities impacted by or dependent on the ASM sector* – will require equally strong commitments from partners with complementary strengths, abilities, resources and the dedication needed to support on-the-ground change. CASM must play a critical role in advocating for these commitments and mobilizing the action needed to realize the development potential of ASM.

Despite the many challenges facing the ASM sector, a clear way forward is emerging. With a growing awareness of what is needed to break the ASM poverty cycle, the international community – including CASM, miners and communities, governments, donors, international institutions and agencies, NGOs and mining companies – has a responsibility to heed the call and help mitigate the grinding poverty that is so often associated with ASM. The future of ASM, its communities, the 100 million or more affected by it and, many would argue, the development of many rural economies, depends on it.

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APPENDIX ONE:

Recommendations from The Yaoundé Seminar²⁰

Seminar on:

*Artisanal and Small-Scale Mining in Africa:
Identifying Best Practices and Building the Sustainable Livelihoods of
Communities*

Yaoundé, Cameroon - 19-22 November 2002

UNITED NATIONS ECA DESA

Economic Commission for Africa Department for Economic and Social Affairs

YAOUNDE VISION STATEMENT:

Contribute to sustainably reduce poverty and improve livelihood in African Artisanal and Small-scale Mining (ASM) communities by the year 2015 in line with the Millennium Development Goals.

GOALS:

- Acknowledge and reflect the ASM sectorial issues in national legislation, and codes;
- Mainstream poverty reduction strategies into mining policy inclusive of ASM policies.
- Integrate ASM policy into the Poverty Reduction Strategy Paper process with linkages to other rural sectors, and develop a strategic framework for PRSPs
- Revisit existing thinking on ASM legislation (traditional land rights, and modern land use legislation nexus) and role of central government;
- Strengthen Institutions:
- Improve the availability of appropriate technologies
- Develop analytical & business skills
- Undertake necessary reforms of the ASM sector: Improve policies, institutions, processes and the ASM stakeholders' livelihood, reduce child labour, ensure gender equality, improve health and safety, develop partnerships, promote sustainable use of natural resources, infrastructure development and land use management.

THE CHALLENGES facing the ASM sector

- Dwindling rural livelihood choices in a marginal environment and in remote regions.
- Increasing number of people seeking a livelihood in ASM.
- Limited public budgets & competing needs.
- Increasing poverty exacerbated by HIV/AIDS/STDs, natural disasters, etc.
- Increasing use of child labour

²⁰ These recommendations have been extracted from the summary reports from the Yaoundé Seminar. This and other Yaoundé Seminar reports can be found at the CASM website: www.casmsite.org.

- Severe gender inequality
- Increasing pressure on available resources (institutions, land, mineral resources, etc.)

WHAT TO DO:

Governments and Development Partners should:

- Formalize government commitment to ASM issues.
- Revisit mining policies in order to assess their capacity as an engine for poverty alleviation (link to the Poverty Reduction Strategy Paper process).
- Increase the profile of ASM in International Financial Organizations (IFIs) and donor agencies
- Undertake necessary reform of the ASM sector:
 - Ensure appropriate legislation for ASM: Acknowledge and reflect ASM sector in national legislation, and codes;
 - Revisit existing ASM policies and legislation with implication to traditional land rights on modern land use legislation and role of central government;
 - Update rules, regulations, and legislation.
 - Adopt appropriate and enforceable Health & Safety guidelines
 - Adopt appropriate and enforceable Environmental guidelines
 - Establish partnerships with NGOs (i.e., BPD – Care International, etc.)
 - Ensure gender equality
 - Launch child labour reduction programmes
 - Provide credit facilities, and co-operative saving schemes. Make available credit and loans schemes, micro credit, and credit co-operatives
 - Ensure free and equitable markets
- Improve the availability of appropriate technologies
- Facilitate Institutional Strengthening and Community Training:
 - Ascertain areas suitable for ASM activities (better knowledge of mineral resources) and improve the methods of exploration, extraction processing and marketing so as to maximize efficiency and effectiveness of ASM as a business venture
 - Community health issues: establish HIV/AIDS and STDs general community health awareness programmes
 - Awareness to sustainable livelihood of communities.
- Stimulate stakeholders' partnership (government as all levels, NGOs, banking organizations, professional organizations, mining companies, etc...)

Governments (national, local)/ ASM communities and CBOs/ Opinion leaders/ IFIs and donor agencies/ NGOs, private sector/ Academia/ public institutions/ Banks should:

- Identify alternative livelihoods strategies realizing that ASM is a finite venture
 - Integrate ASM sector into rural community development programmes
 - Stimulate capacity-building, and technical and organizational development

- Facilitate access to basic social services and transport infrastructure development
- Streamline marketing channels
- Facilitate community-led activities:
 - Sensitization and empowerment campaign to promote community organization and micro-business development:
 - Develop analytical & business skills.
 - Establish ASM co-operatives and associations
 - Community-based saving plans for productive investment
 - Remove gender-based constraints and the identify women leaders to stimulate alternative income generating activities
- Health cooperative for prevention and care of sick people, particularly those living with HIV/AIDS.
- Raise awareness, have more stringent law enforcement and monitoring coupled with the generation of alternative income opportunities,
- Family support service and the provision of affordable education to reduce child labour on ASM sites
 - Build community based partnerships with local authorities and local private sector, and opinion leaders.

TASKS FOR INTERNATIONAL STAKE HOLDERS

(Private sector, IFI, donors, NGOs)

- Identify and disseminate best/good practices regulations (Pan-African)(CASM)
- Present the recommendations/vision statement of the Yaoundé Seminar to the WB/EIR Regional consultative workshop in Maputo, Mozambique, 13 January 2003 (UNECA – UNDESA)
- Establish a Yaoundé communication network through CASM and encourage other countries to join (March 2003)
- Identify available resources for ASM support (CASM)
- Review existing baseline surveys to assess relevance to “Yaoundé vision statement” in selected countries (CASM and UNDESA, September 2003)
- CASM AGM and learning event in Africa, September 2003
- Identify key stakeholders (affected, interested, beneficiaries, providers, developers, donors) to build the Yaoundé Network by August 2003
- Establish an inter-agency (UNAIDS, UNDESA, ECA, etc.) working group on HIV/AIDS in mining by August 2003

NATIONAL LEVEL TASKS FOR STAKEHOLDERS, GOVERNEMENTS, PRIVATE SECTOR, NGOs/CBOs

- Lobby and increase the profile of ASM issues within governments and the LSM private sector and country (ASM organizations)
- Convene national workshops:
 - Build partnerships with government and the private sector
 - Baseline survey – identify key issues, both positive and negative and establish common benchmarks
 - Collate, consolidate existing information (Government)
 - Liaise with global ASM networks (e.g.CASM)

Deadline: September 2003