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Vulnerability of Artisanal and Small Scale Mining to Commodity Price Fluctuation

PAPER 5: The Impact of Price Fluctuations on Livelihood Strategies in Artisanal and Small-Scale Mining Communities Compared with other Non-Financial Shocks

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Summary

This paper examines the impact of price fluctuations on livelihood strategies in artisanal and small-scale mining (ASM) communities compared with other non-financial shocks and makes recommendations for minimising the vulnerability of ASM communities to price fluctuations.

It is argued that the impact of price fluctuations on the livelihood strategies of small-scale miners depends on a number of factors including the nature and scale of engagement in ASM, the livelihood context and existence of alternative income generating opportunities, the nature of the market and influence of intermediaries on price, and the existence of support mechanisms. In the majority of cases, ASM is a poverty-driven livelihood strategy and is the most promising income opportunity available. For those already engaged in ASM activities, price fluctuations are unlikely to affect the decision to mine but will impact on the time spent on the activity and the number of family members involved (including children and the elderly). Price fluctuations will affect the amount that households are able to spend on essentials such as food, clothes, schooling and medical care and thereby the demand for locally produced goods and services. The ability to forward plan and invest in other more sustainable economic activities will also be influenced. Broadly speaking, the greater the level of commitment and dependence on small-scale mining, the higher the vulnerability to price fluctuations.

The paper finds that the relationship between price and the numbers involved in ASM is not straightforward. Intuitively, an increase in price should lead to an increase in the numbers involved in small-scale mining and this is certainly evidenced in rush activities, often with negative social and environmental consequences. However, a decrease in price may also lead to an increase in the number of people turning to ASM as they are retrenched from large-scale mines that are forced to cut back or close down. Since the capital and labour costs of ASM are less, they are arguably better able to survive periods of low commodity prices. Other factors such as the availability of alternative employment and the relative price of agricultural produce also play a role.

The nature of the market and influence of intermediaries on price need to be taken into consideration. Prices are often determined by local intermediaries rather than by the global market and, in some cases, miners work for wages determined by the level of production they attain rather than the commodity price. While price fluctuations do have an impact on the livelihood strategies in ASM communities, their vulnerability to other 'non-financial shocks' such as land eviction, conflict with large mines or the government, accidents, environmental damage and social tension are at least as important. Policy interventions should therefore take a holistic approach rather than seeking to tackle any one shock in isolation.

Finally this paper recommends a number of ways of reducing the vulnerability of small-scale miners to price fluctuations. It suggests that small-scale miners should be helped to attain a fair price for products through providing access to market information and training in marketing and book-keeping. Better and more stable prices for ASM output could be achieved through cutting out intermediaries and providing a guaranteed market for ASM commodities. And the impact of price fluctuations can be cushioned through ensuring that there are adequate support mechanisms such as cooperatives and credit unions.

Encouraging diversification in the range of minerals mined will also reduce the vulnerability of small-scale miners to fluctuations in the price of a particular commodity. Finally, efforts need to be taken to ensure that the revenue generated from ASM is invested in other forms of economic activity so that ASM communities have alternative livelihood strategies to turn to.

Table of Contents

1 Introduction

Artisanal and small-scale mining (ASM) plays an important role globally involving an estimated 13 million people directly, mainly in developing countries, and affecting the livelihoods of a further 80 to 100 million.[1] It is a livelihoods strategy adopted primarily in rural areas and tends to be driven by poverty. In recent years ASM has grown as an economic activity, typically employing redundant large-scale mine labourers, seasonal farmers, and nomadic dwellers, and complementing more traditional forms of rural subsistence earnings. From a livelihood perspective ASM often provides the only means of obtaining income and is therefore important. Yet for many people it never generates more than a subsistence wage and does not seem to be able to become an engine for growth and lasting poverty reduction.

The term 'artisanal and small-scale mining' can be used to cover a broad spectrum of activities, from artisanal mining which may involve individuals and families and is purely manual, to small-scale mining which is more extensive and usually more mechanised. This paper focuses on ASM in developing countries, that uses the most basic methods for extraction and processing. Broadly speaking it is a labour-intensive activity which involves the exploitation of marginal deposits with low rates of recovery. More often than not artisanal and small-scale miners operate in the informal sector, outside the legal and regulatory sector and without formally recognised rights to land. Their difficult situation is compounded by a lack capital and poor access to markets and support services.

This paper examines the impact of price fluctuations on livelihood strategies in ASM communities compared with other non-financial shocks. It begins by considering the impact of price fluctuations in the context of the nature and scale of engagement in small-scale mining and the availability of alternative income generating opportunities. It then considers the importance of the livelihood context including the involvement of different members of the family and the dependence of broader community. It also examines the extent to which the nature of the market and the role of intermediaries affect the price received by small-scale miners and therefore their vulnerability to price fluctuations. Finally it considers the extent to which the existence of support mechanisms helps to cushion the impact of fluctuations.

To place the impact of price fluctuations in context the paper looks at the relative vulnerability of small-scale miners to 'non-financial shocks' such as land eviction, conflict with large mines or the government, accidents, environmental damage and social tension. It concludes with a series of recommendations on policy and other instruments and processes which can help to minimise the vulnerability of ASM communities to price fluctuations. The research is based on a review of relevant literature and consultation with ASM experts.

[1] Social and Labour Issues in Small-scale Mines, Report for discussion at the Tripartite Meeting on Social and Labour Issues in Small-scale Mines, Geneva, 17-22 May 1999, ILO, Geneva.

2 The Livelihood Context

In considering the impact of price fluctuations on the livelihood strategies of small-scale miners it is important to understand the livelihood context in which they operate. Context such as the nature and scale of engagement in mining, the involvement of family members including women and children, and the reasons for getting involved in small-scale mining.

2.1 The nature and scale of engagement in ASM

The nature and scale of engagement in ASM varies between different countries, and between communities within countries. For some ASM represents a full-time activity providing the principle means of subsistence, while for others it is a part-time or seasonal activity and supplements other activities. Some communities have engaged in ASM for generations while others are drawn to it following the findings of new reserves or a dramatic increase in demand for a particular commodity. An increase in ASM activity can also be associated with periods of economic recession reflecting a lack of formal employment opportunities in the mining sector or an absence of alternative economic activities.

2.1.1 ASM as a full-time activity

In some cases miners are driven to engage in ASM as a full-time activity by absolute poverty and a lack of alternative income generating activities. An example of such activity are the rural women in KwaZulu Natal, South Africa, who mine kaolin at great personal risk to themselves to be sold to intermediaries at below market value or to communities to be used as cosmetics or medicine.

Other small-scale miners operating on a full-time basis have organised themselves in a semi-formal business fashion and have grown substantial operations that sustain whole communities. One such example are the brick makers in Osizweni, also in KwaZulu Natal, who have been mining clay and making bricks for over two decades, and in the process are able to economically sustain an entire community.

2.1.2 ASM as a seasonal or part-time activity

In different developing countries throughout the world ASM more commonly serves as a seasonal or part-time activity alongside other activities, most commonly agriculture. In such cases ASM provides a means of generating additional income for the household or satisfying a particular need. In Malawi, for instance, subsistence farmers mine gemstones in the dry season when there is less agricultural work to be done. Similarly in Guinea (where approximately 100,000 people are involved in small-scale gold mining) mining is mostly a seasonal activity with agriculture-based income-generating activities taking precedence during the rainy season (Labonne 2003). In Mali it is estimated that up to 300,000 people are engaged in gold mining and although it has become the main income generating activity it remains a seasonal occupation (Labonne 2003)

Some communities engage in ASM activities all year round but only on a part time basis. An example of this is in the Amazon region of Ecuador where approximately 500 families from the indigenous population settle along the river borders during the weekends and manually wash gold gravels.[2]

2 Fundacion Ambiente y Sociedad (2002), ASM Equador Country Study, MMSD.

In any one country different communities may engage in ASM activities on different scales and at different times of year. In Papua New Guinea, for example, communities may engage in ASM activities as a seasonal activity or as a part-time year-round activity to satisfy specific needs. As a general rule people in Papua New Guinea use mining as a source of cash, mining gold when they need money for school fees, medical expenses, social obligations or travel. This means that people engage in full-time mining activity at the beginning of the year when school fees are due and again around Easter and Christmas time. A sizable proportion of the population mines on a part-time basis all year round to supplement other activities and another section engage in agricultural activities such as growing coffee and do not mine during coffee harvesting (Susapu, B. and Crispin, G. 2002).

2.1.3 ASM as a traditional activity

In countries such as Bolivia, Colombia, Indonesia, Mali, the Philippines and Zimbabwe miners often come from communities that have a long tradition of small-scale mining and have strong cultural ties to the areas in which they mine. In tribal mining communities, for example, these ties can extend back for many generations. Other communities are engaged in mining for socio-cultural reasons. Many of Ghana's *galamsey*[3] gold miners, for example, continue to mine concessions awarded to large-scale mining companies contending that they have cultural ties to the land their ancestors mined for centuries (Hilson, G.M. 2003).

2.1.4 ASM as a temporary or 'rush' activity

In contrast, ASM may be taken up as a sudden 'rush' activity following the discovery of new mineral reserves, as with gold or diamond 'rushes' during which thousands of people hope to make their fortunes. Examples of this include gold mining in Serra Pelada in Brazil, Mt. Kare in Papua New Guinea and Nambija in Ecuador, and sapphire mining in Illakain in Madagascar.

An increase in the demand - and thus price - for a particular mineral can also result in rush activities. For example, the global increase in the use of mobile phones recently contributed to a surge of informal mining activity for coltan in the Democratic Republic of Congo (MMSD, 2002).

2.1.5 ASM and economic recession

In many cases ASM is an activity taken up in times of economic recession, often linked to a shortage of alternative economic opportunities in rural areas of developing countries. Linked to this, it is also often taken up in response to low agricultural prices. In Papua New Guinea, for example, over the last 10 years there has been an increase in the number of people mining as the economy has declined and agricultural returns diminished. ASM has become an increasingly important source of income for people in rural areas as the prices for traditional crops of coffee and copra has remained low. In some areas such as the Wau area in Morobe Province, rural cropping has been almost completely abandoned in favour of mining. The local economy has been transferred from subsistence to a cash-based society as a consequence (Susapu, B. and Crispin, G. 2002).

Similarly, the growth of the gold panning sector in Zimbabwe is largely linked to the economic distress situations of the 1980s and '90s. In 1990 the Government adopted an economic structural adjustment programme which resulted in many industries streamlining their operations and retrenching thousands of workers, a significant

[3] Galamsey is a vernacular term in Ghana for small-scale miners.

proportion of whom turned to artisanal gold mining. In recent years, the decline in world metal prices and the downturn of the Zimbabwean economy has caused many of the large-scale mines to close down. Many of the retrenched miners have then taken up ASM activities, as have those previously engaged in downstream and supportive transport and manufacturing industries. Finally, the poor agricultural yields caused by the severe regional droughts of the 1980s and '90s forced the poorest communities, the majority of whom reside in the rural areas, to turn to the exploitation of minerals as a means of survival.[4]

2.2 The involvement of family members and the broader community in ASM

In contrast to large-scale mining activities that employ predominantly men, ASM activities often involve several household members including women and children. ASM also contributes to the livelihoods of people other than miners and their dependents, often playing an important role in the local economy.

2.2.1 The involvement of women

Women are frequently involved in ASM operations. In Bolivia, for example, women account for around 40 percent of the ASM work force; in Madagascar, Mali and Zimbabwe the proportion is 50 percent; and in Guinea, the figure is 75 percent (MMSD 2002). They are also indirectly involved through ancillary activities such as the supply of food, drinks, tools and equipment. A distinct advantage of having female members of the household involved in mining is that they are more likely than men to spend their income on maintaining their families – investing in, for example, food, schooling, clothing or agriculture.

In many countries women receive less money for their work. They also tend to lack access to credit and finance and as a result may be prevented from fully participating in small-scale mining activities. For example, working without credit women are trapped at a subsistence level of mining, extracting what is easiest, and confining themselves to a precarious existence.

There has been an increase in the number of women participating in ASM activities in recent years. In Mozambique, for example, this increase is attributed to a number of factors including: low commodity prices; a lack of alternative employment opportunities; the effect of droughts on the fertility of farmlands; a lack of farmland; and high birth rates, extended families, and greater economic independence amongst women.[5]

2.2.2 Child labour

Child labour is widespread in much of ASM and is closely linked to poverty: the more remote or informal the activity, the more likely it is that children will be involved. Children undertake all mining activities, often for little or no pay. Even though poverty is cited as the major cause of child labour, it is not the only determinant. Inadequate schools, a lack of schools, or the expense of schooling leaves some children with little else to do but work. The attitudes of parents also contribute to child labour; some parents feel that children should work in order to develop skills useful in the job market, instead of taking advantage of a formal education.

[4] Dreschler, B. (2002), ASM Southern Africa (Zimbabwe Country Study), MMSD.

[5] Dreschler, B. (2002), ASM Southern Africa (Mozambique Country Study), MMSD.

2.2.3 The involvement of the broader community in ASM

ASM often makes an important contribution to the livelihoods of people in the local economy and to rural development more broadly through serving as an important supplement to other rural economic activities. It can also play a critical role in helping to slow the growth of urban areas and particularly urban slums in countries experiencing rural poverty (Sinding, K. 2004).

ASM activities tend to stimulate demand for locally produced goods and services – food, tools, equipment, housing, and various types of infrastructure. In Ecuador, for example, it is estimated that some 25,000 people are directly involved in activities such as the sale of food and other provisions, the construction of homes and storage facilities, the sale of tools and equipment, and the supply of transport and fuel.[6] In Papua New Guinea it is estimated that there are seven people dependent in some way on the industry for every person directly employed in ASM: this translates into a further 420,000 people being dependent in some manner upon ASM, representing approximately 9 to 10 percent of the population (European Union 2001).

ASM can also create upstream and downstream employment opportunities. For example, many miners do not complete the processing themselves but instead sell the ore to intermediaries who concentrate it and transport the products to market, creating upstream employment.

In addition to creating employment and income generating activities ASM activities can have broader, and often profound, socio-economic impacts such as the birth of townships and the construction of penetration roads and tracks. It can also result in the introduction of motorised transport and the conversion of subsistence economies to cash dependency. The broader impacts will, however, depend on the nature of engagement in ASM. In Zimbabwe small-scale miners (predominantly gold diggers and panners) are highly nomadic and rarely spend more than two years in one particular panning area. As a consequence they tend not to develop permanent infrastructure such as houses, water and sanitation. Few of the miners own land and where they do it tends to be far removed from the panning area.

3 Understanding the impact of price fluctuations On livelihood strategies

3.1 The impact on existing ASM activities

A range of different factors will influence the impact of price fluctuations on livelihood strategies in ASM communities. The way in which these factors play out is complex and will, to a large extent, depend on local circumstances. Although some general inferences can be made about the likely impact of price fluctuations on livelihood strategies, the overall impact of price fluctuations on the commitment of small-scale miners to existing activities is unclear.

For those already engaged in ASM activities price fluctuations are unlikely to affect the decision to mine but may impact on the time spent on the activity and the number of family members involved. Where communities engage in ASM activities on a full time basis an increase in the price of the commodity being mined could result in an increase in the time spent mining over other non-income generating activities since the opportunity

[6] Fundacion Ambiente y Sociedad (2002), ASM Equador Country Study, MMSD.

cost of spending time on other activities will increase. On the other hand, an increase in price could reduce the amount of time spent mining since households will be able to generate sufficient income from the mining activity to meet their basic needs in a shorter period of time.

Where ASM is a seasonal or part time activity an increase in the price of the commodity being mined will increase the attractiveness of mining over alternative economic activities, such as agriculture, and is likely to lead to an increase in the amount of time spent mining. However, communities are unlikely to abandon other economic activities since they cannot be guaranteed that the higher price of the commodity will prevail and they often depend on these activities to meet basic subsistence needs. The impact will also depend on relative changes in the price of alternative commodities, typically agricultural.

Since the involvement of women, and particularly children, is often driven by poverty a decrease in prices is likely to result in an increase in their involvement to ensure that the same level of income can be maintained. The involvement of other economically inactive members of the household, such as the elderly or infirm, is also likely to increase.

Broadly speaking, the greater the level of commitment and dependence on small-scale mining, the higher the vulnerability to price fluctuations. Where there has been investment in a specific site, skills or equipment, the impacts are likely to be more significant. This is equally the case where there is a high dependence of other economic activities on ASM, such as processing activities and the supply of mining-related services.

Price fluctuations will affect the amount that households are able to spend on essentials such as food, clothes, schooling and medical care and thereby the demand for locally produced goods and services. The ability to forward plan and invest in other more sustainable economic activities will also be influenced.

Communities with a strong tradition of mining are more likely to be able to cope with the effects of price fluctuations than communities that are new to mining. Traditional more established communities are likely to have experience of adapting to such changes and will also have stronger local support networks. The existence of broader support mechanisms such as cooperatives and credit schemes may also help to cushion the impact of price fluctuations.

Finally, it is important to consider the scale and frequency of price fluctuations. Small changes, for example, are unlikely to have any significant impact on livelihood strategies. Where price fluctuations occur with relative frequency communities are more likely to be able to develop coping mechanisms – such as a degree of dependence on other activities - to deal with these.

3.2 The impact on the numbers involved in ASM

More significant is the impact that price fluctuations have on the numbers involved in ASM activities. Intuitively, an increase in price should lead to an increase in the numbers involved in small-scale mining and this is certainly evidenced in rush activities. This argument is supported by conventional theory which proposes that natural resources booms are triggered by changes in global commodity prices and collapse when these prices fall (Cleary 1990; Mainardi 1995).

There is certainly evidence to suggest that the number of miners fluctuate with the international demand, and thus price, for a particular mineral. For example, as described above, the global increase in the use of mobile phones recently contributed to a surge of informal mining activity for coltan in the Democratic Republic of Congo. Conversely, low prices can result in small-scale miners moving away from such activities. In Burkino

Faso, for example, recorded gold production decreased from 1,499 kg in 1990 to 513 kg in 2000: this is attributed to a decrease in the official price paid for gold within Burkino Faso and an increase in smuggling, with higher prices being paid in neighbouring countries (Gueye, D. 2002).

The low capital costs, and therefore costs of entry and exit into the industry, arguably increases the sensitivity of small-scale mining to price fluctuations. In China, for example, the author of the MMSD country study on China cites an example of a valley in which he worked where, over the period of one year, the number of gold mines halved from an estimated 80 to 40, due to a reduction in gold prices.[7]

It could also be argued that small-scale miners are more vulnerable to price fluctuations than large mining companies because they have a low production capacity and therefore a limited quantity of minerals to sell and a limited bargaining power against buyers.

However, there is evidence to suggest that a reduction in price can also lead to an increase in the numbers engaging in ASM activities relative to large-scale mining as a result of falling prices. In the Democratic Republic of Congo, even after the price of coltan dropped dramatically, the very low labour cost at small-scale mines kept them profitable and sustained the numbers involved (UN report, (2002), p 21). In Zimbabwe, low metal prices, coupled with a critical shortage of foreign currency and general economic decline, has resulted in more than 30 large-scale mines being forced closed down in the last few years. Many of the retrenched workers have turned to small-scale mining resulting in an overall increase in the numbers involved in ASM activities. Similarly in Zambia, the economic downturn which began in 1974 and was triggered by a combination of falling copper and rising oil prices, resulted in an increase in people turning to ASM activities because of the lack of alternatives.

3.3 Other factors influencing entry and exit decisions

It is important to emphasise that price is by no means the only factor influencing decisions to enter into, or exit, small-scale mining activities. A recent analysis of small-scale gold mining in Suriname found that extractive booms driven by local resource users can occur independently of global price markets.[15] The findings suggest that national economic recession has been the most important factor encouraging small-scale gold mining and that the decision of whether or not to mine is based on comparing gold mining with other economic opportunities and choosing the activity with the highest expected income.

In Surname mining wages compared positively to economic alternatives in general. The annual average per capita GDP in the 1990s was below US $2000, which is less than a mining income if one were to mine just 6 months out of the year. These observations suggest that mineral prices would have to drop to half of their current levels before alternative income generating activities in Suriname's formal economy may compete with incomes people can expect in gold mining.

This study is the first to empirically support the argument that small-scale miners are less sensitive to changes in mineral prices than large-scale mining companies. The paper suggests that the unequal response of local miners and multinational mining firms to commodity prices derives from the different scales at which they make decisions. It argues that small-scale gold miners consider a variety of local factors, including the cost of living, the availability of other economic opportunities, and wages. Rising consumer prices and unemployment encourage small-scale mining both directly and indirectly. Directly, high prices increase daily expenses and hence the need for hard currency. In

[7] Gunson and Yue Jian (2001), ASM China Country Study, MMSD.

addition, the high costs of urban living make it beneficial to work in the rural areas. Unemployment decreases the availability of jobs other than mining. Moreover, a poor economic climate may provide incentive to previously inactive household members to enter mining, including children and the elderly (Heemskerk, M. 2001). Cases elsewhere suggest that this argument has validity beyond Suriname. Gold and diamond mining in Brazil, Angola, and Sierra Leone, for example, boomed in times of high inflation, and socio-economic stress.

Fluctuations in the costs of production may also influence entry and exit decisions. Small-scale miners are arguably more vulnerable to changes in the costs of capital and other inputs because they are poor and therefore have few reserves. Moreover, inefficient mining practices can push up the production costs incurred by artisanal and small-scale miners. On the other hand, many ASM activities are characterised by very rudimentary methods of extraction and production and therefore capital costs are not significant. Evidence suggests that the cost of mercury, for example, influences the numbers engaged in small-scale gold mining activities. Usually the price of mercury is very low (~US$4/kg) but in ASM areas the price fluctuates around US$10. In Laos, the cost of mercury is so high that this is forcing miners to reduce use (finding new techniques) and recycle mercury (with consequent positive health and environmental benefits). However, in Brazil when operating costs increase miners use more mercury in the hope of increasing gold production (Veiga, M. and Hinton, J. 2002).

The quality and accessibility of the mineral reserve is also significant. Miners will seek high-grade deposits, often resulting in significant migration. In Africa, for example, gold mining communities can be formed and abandoned over as little as a six month period, always moving to areas with easier and richer ore. Similarly in the Amazon artisanal gold mining is a temporary activity which continues until deposits of easily extractable gold are exhausted.

A whole host of other supply and demand factors will also influence decisions to mine including improved mining technology, the opening up of particular areas through the construction of new roads, the number of competing miners, and the degree of political stability in the country.

3.4 Difficulties in estimating the impacts of price fluctuations

The informal nature of many ASM operations can make it very difficult to accurately estimate overall levels of activity and the impact of price fluctuations on this. This is compounded by the often migratory nature of ASM activities and the high incidence of mined products being smuggled into neighbouring countries.

In Tanzania, for example, the inspectors of the Ministry of Energy and Minerals have attempted to register the official gold production in the Geita region. Their register implies that the gold production from ASM fluctuates substantially. For example, in 1991, when the Government was buying gold through the National Bank, reported production was around 617 kg per annum and dropped to approximately 2 kg per annum from 1993 to 1996 when the Bank stopped buying gold. When a private company, Meremeta, introduced a custom milling operation in 1997 and started buying gold in the region the official gold production increased from 2 kg in 1996 to 420 kg in 1998. Recently the company ended its activities and the reported gold production declined again to 153 kg in 2001 and 14.1 kg in 2002. Currently, there are a number of individual gold buyers in the region and they do not report the exact amount of gold purchased from miners. As a result the Government is not collecting adequate taxes and most of the gold is thought to be smuggled out of the country.[8]

[8] Personal communication.

Despite economic changes in the 1980s the smuggling of minerals out of Tanzania has persisted for a number of reasons including: better prices in neighbouring countries due to currency fluctuations, the avoidance of taxes and the lengthy bureaucracy involved in acquiring exporting licenses for mineral commodities. A very similar situation is occurring in Zimbabwe where the large number of recorded miners (around 350,000) and very low gold production is a clear indication that gold is being smuggled out of the country as miners look for better prices. Frequent border crossings has also contributed to the emergence of a black market within many Latin American countries. For example, Uruguay, which is not a gold-producing country, exported 29.4 tonnes of gold in 1984, the bulk of which most likely came from the Brazilian Amazon via São Paulo (Creary, D. 1990).

3.5 Price and the market for ASM produce

Perhaps of greater concern for the livelihood strategies of small-scale miners than volatility in mineral prices is the fact that they are often already receiving a relatively low price for their commodity or working for unreasonably low wages. Moreover, small-scale miners are often more dependent on the prices fixed by local buyers and intermediaries than global market prices and in this respect will be less vulnerable to international commodity price fluctuations.

Small-scale miners typically need to sell their products as quickly as they can and usually receive low prices, often only amounting to only 30 to 50 percent of global market prices. Those working further along the chain – traders, intermediaries, and manufacturers – tend to benefit from the profits. This imbalance tends to be greatest when the miners are working illegally without any formal protection from the state, and are effectively selling black market goods and being exploited by intermediaries or traders, rarely getting fair prices. In Mali, large foreign traders control about 90 percent of gold exports. Traders buy gold on site through a complex network of intermediaries and local buyers who often have 'special' links with gold washers (for example providing loans for them to buy food) and pay prices which are difficult to control and are much lower than the prices on the world market. As described earlier, in Mozambique private traders buy an estimated 80 percent of the gold and gemstones mined by small-scale miners (Dreschler, B. 2002).

The price received by the miner also depends on the number of middlemen involved in the business – the greater the number of middlemen, the lower the price the miner obtains. As anecdotal evidence of this, in Tanzania, a cats eye round-shaped rough alexandrite weighing 2 to 3.5 grams in 1996 was sold by a miner at Tunduru mine site at 0.5 to 0.8 million Tanzanian shillings (TShs) to a small broker. The broker sold the same stone to secondary broker residing in Tunduru town at 0.5 to 1.5 million TShs. A dealer in Dar es Salaam then paid 3.0 to 3.5 million TShs for the stone which in turn was sold to a foreign buyer at 4 to 4.6 million TShs.

The vulnerability of small-scale miners to exploitation by intermediaries can be exacerbated by a lack of collective bargaining capacity with operations often focused at the individual or household level. It is further exacerbated by a lack of technical training and poor access to geological information. In India, for example, the marketing for the poorer, smaller mine owners tends to be carried out through middlemen or traders who take full advantage of the mine owners who, due to lack of resources, means and awareness, are unable to deal with the real customers directly. However, most of the small-scale miners in the higher range of production have their own marketing staff who engage the help of mining associations to negotiate with larger customers and Government organisations. In some cases the unofficial prices may actually be higher than the official prices, for example, where mineral prices are significantly higher in one country than another and minerals are therefore smuggled across borders.

Where small-scale miners are employed the workforce is rarely recognised by trade unions and they often have no recognisable contract or guaranteed wage. In 'gold rush' type activities in exchange for hard labour, food and shelter are often provided as well as a promise of a percentage of the value of material found. Most quarrying for building and road-working materials is carried out at small mines where people tend to work for wages, generally based on production, for the quarry owner or the contractor who manages the concession. In some countries, mainly in Asia, hundreds of thousands work at small-scale coal mines. These workers tend to be paid a wage but there is often at least one intermediary between the miner and mine owner and wages can be heavily discounted. (Jennings N S, 2003).

In some countries governments have sought to set up more formal marketing channels for ASM produce. This serves the dual purpose of protecting small-scale miners from exploitation and enabling the state to collect royalties from the sales. Such efforts have met with varying degrees of success. In Ghana, for example, in an attempt to create avenues for small-scale miners to sell their products, the Precious Minerals Marketing Corporation (PMMC) was established in 1989. The Corporation has some 750 licensed buying agents and subagents who travel the country, purchase gold from artisanal miners, and in turn sell it back to the Corporation. An important initiative undertaken by the Government was to mandate PMMC to provide competitive rates for mined small-scale gold and diamond product. Prior to 1993, PMMC set its gold buying price at the world market rate less 3 percent for its commission and 4 percent for a Land Rehabilitation Fund. This rate, however, was not competitive with that of unauthorized buyers, and in 1993, a more aggressive approach was adopted. The organization now sets a buying price weekly, at a guaranteed rate of 98 percent of the world market price. The move resulted in the immediate doubling of small-scale mining purchases in that year.

In some cases, such as in Guyana, where governments have established marketing boards, small-scale miners may prefer to deal with unofficial traders to get better prices. Even in situations where the official exchange rate is close to the black market rate, small-scale miners may still prefer dealing with unofficial traders to avoid paying loyalties (Hilson, G.M. 2003).

Examples also exist of large mines intervening to assist small-scale miners to sell their products at the prevailing market price. In Ghana, for example, Gold Fields Ghana Ltd. managed an underground complex through to the end of 1999, and commenced operations at its main Tarkwa surface mine in 1998. The area, however, has long been occupied by thousands of *galamsey*, some of whom are displaced workers from neighbouring large-scale mines, and others are local villagers. The mine management, in an attempt to prevent land use disputes, undertook a series of initiatives to improve relations between the parties. It first ascertained that certain areas of the land concession contained alluvial gold deposits suitable for small-scale mining and then awarded these to resident small-scale miners. It then established purchasing services, whereby the mined product can be sold to Gold Fields Ltd on site at the prevailing market prices.

4 The importance of 'non-financial shocks' on livelihood strategies

The fact that small-scale miners tend to be poor and operate largely in the informal sector means that they are vulnerable to a whole range of other 'non-financial shocks'. Operating beyond government supervision, they do not strive to follow health and safety

regulations or meet environmental standards. Neither do they receive any formal support in areas such as bookkeeping, marketing, processing or value-adding. Even where there is a will to do so, governments find it difficult and expensive to enforce environmental, health and safety regulations and to provide positive support. Poor access to finance means that small-scale miners are often operating hand-to-mouth with few savings, further increasing their vulnerability.

Thus while price fluctuations clearly do have an impact on livelihood strategies in ASM communities, their vulnerability to other 'non-financial shocks' such as land eviction, conflict with large mines or the government, accidents, environmental damage and social tension is probably more significant.

4.1 Conflict

At a macro level many of the countries in which small-scale miners operate are poor and politically unstable making them susceptible to civil war and other forms of conflict. For example, the stagnation of gold mining in Suriname between 1986 and 1990 probably reflects the inaccessibility of the interior during the initial years of the interior war.

In some circumstances social tension and conflict can be caused by small-scale mining activities. For example, rush operations can cause disruption linked to the high levels of in-migration involved. When large numbers of new people arrive in an area, they can come into conflict with local residents, sometimes provoking violence and introducing new social and health problems.

In addition, as deposits are depleted, miners may migrate to other regions and often cross borders into neighbouring countries, sometimes creating international conflicts. It is estimated that in Suriname, for example, between 15,000 and 30,000 artisanal miners are illegal immigrants from adjacent countries, such as Brazil (Veiga, 1997).

4.2 Land eviction

In some instances small-scale miners have legal title to the land that they work, which is recognised by the state and others. In other cases they work the land they have traditionally inhabited but without any recognition of land rights from the state, or they may be working the land informally and be regarded as illegal squatters by local and state authorities. Working without mining title or any kind of contract makes them vulnerable to eviction.

Conflict between large and small operations often arises, particularly over ownership of mineral deposits. Government sometimes evict small-scale miners to grant concessions to large companies, depriving small-scale miners of their livelihoods. In some cases a legitimate process of resettlement and compensation is undertaken to allow large-scale mining to take place. In others, government intervention or even police involvement to enforce company entitlement is used, often forcing small-scale miners further into illegality. This can lead to resistance and resentment and conflict may ensue. An example of this is the reported attempt by the Brazilian state mining company, CVRD, to evict a group of small-scale miners from a concession in Serra Leste. The local miners are alleged to have taken seven employees of the mining company hostage until their demands were met (Rosendale Sweeting, A. and Clark, A.P. 2000).

In extreme cases, governments may enforce bans on small-scale miners if the land rights are not recognised or the health, safety, environmental and social costs are perceived to be too high. A recent example of this is in China where in 2001 the Central Government ordered a State Order to close all of the country's small mines immediately on the grounds they posed excessive safety risks (Gunson and Yue Jian, 2001). However, governments that have tried to shut down ASM activities have generally failed. When the

miners have no other source of income, they will usually find ways to evade controls and carry on working.

4.3 Accidents

Small-scale mining activities are characterised by low standards of health and safety with miners often operating in harsh and often dangerous conditions. Poor mining methods and lack of equipment mean that accidents are frequent in the ASM sector. According to the ILO the five major health risks associated with ASM are exposure to dust (silcosis); exposure to mercury and other chemicals; the effects of noise and vibration; the effects of poor ventilation (heat, humidity, lack of oxygen); and the effects of over exertion, inadequate work space and inappropriate equipment. Women and children can be particularly vulnerable to the heath risks associated with small-scale mining.

In addition, small-scale miners are exposed to many accidents such as the collapse of mine shafts and underground flooding. Accidents may be caused by a number of factors including rock falls and subsidence, lack of ventilation, misuse of explosives, lack of knowledge and training, and obsolete and poorly maintained equipment (ILO, 1999).

Governments may also attempt to enforce health and safety regulations which may prove to be prohibitively expensive for small-scale miners and cause them to either go out of business or operate illegally.

4.4 Health

Those engaged in ASM are already some of the poorest people and are therefore unlikely to have adequate sanitation, with little access to clean water or basic health care. These problems are likely to be even worse where miners have converged around a freshly discovered deposit or settled in unorganised camps. Many of these boom towns develop haphazardly with little or no planning. As a result, working and living areas often overlap; miners frequently build houses at the mine entrance, for example, to protect their property. In some circumstances, the living quarters can be more dangerous than the mine.

Although settlements may eventually be recognised formally as a town or village, this may not happen for years and a whole generation of children may be exposed to multiple disease threats including malaria, cholera, tuberculosis, bilharzias, and other parasitic and infectious diseases.

Particularly where small-scale mining involves rush activities with temporary communities or work camps, sexual diseases such as HIV/AIDs may become prevalent. The consequences of such diseases can have huge implications on the livelihood of small-scale mining communities, particularly where they result in a high incidence of death amongst those of working age.

4.5 Environmental damage

Small-scale mining activities can result in significant environmental impacts with consequent risks to the health of miners and others in the community. Some of the most serious environmental impacts include: mercury and cyanide pollution, dumping of tailings and effluents into rivers, siltation of rivers in places where alluvial gold panning is carried out, destruction of vegetation, and threats from improperly constructed tailings dams. The environmental damage caused by ASM can aggravate economic hardship and cause ill heath. Mining-related degradation of the ecosystem also threatens the livelihoods of people who depend on its services for food and other basic needs and for subsistence agriculture. The reduction of fish and wildlife populations due to habitat

destruction and hunting may decrease the protein intake of people who live near mining areas. Impoverished diets may aggravate the health impacts of other illnesses and diseases prevalent in mining areas such as mercury contamination, sexually transmitted diseases and malaria.

4.6 Change in social order

The advent of ASM activities can have a significant impact on social organisation in the areas in which it takes place. In Papua New Guinea, for example, most of the rural population's income is agriculturally-based and many are paid in-kind or non-wage rewards for their activities. With small-scale mining approximately 50 percent of the population receive some money and the rest are mainly subsistence farm/fish dependent (Asian Development Bank report, 2000).

4.7 Resource depletion

Rush activities can be particularly damaging to ASM communities. Problems also arise when local people are attracted by opportunities that cause them to desert their farms. This is even more likely when the mineral concerned becomes a parallel local currency as gold does. When the rush is over, local people may find that they have seen few lasting benefits to their livelihoods. Most of the profits are likely to have disappeared while the social and environmental damage persists. Many find it difficult to return to their previous livelihoods such as agriculture because of the environmental damage caused by mining activities.

5 Conclusions and recommendations

Price fluctuations are one factor impacting on the livelihoods of small-scale mining communities but are not the most significant. Policy interventions should therefore take a holistic approach to ASM treating price fluctuations as one of a whole range of issues that need to be addressed in reducing the vulnerability of small-scale miners. Broadly speaking, there is a need to focus on policies that consider assistance to ASM as part of overall strategies for poverty alleviation and building sustainable livelihoods.

There are a number of actions that Governments and other organisations can take at local, national and international level to reduce the vulnerability of small-scale miners to price fluctuations at the same time as contributing to broader sustainability objectives. Many of these actions are targeted at ensuring that small-scale miners receive a fair income rather than being directed specifically at price fluctuations.

5.1 Ensuring fair and transparent markets

Ensuring free and equitable markets for small-scale miners is a priority. In order to make these miners less reliant on intermediaries for the sale of their products and to enable them to obtain better prices they need to have access to information on mineral prices and support in accessing markets directly.

It is evident from the examples provided in this paper that if channels are set up to purchase minerals at a reasonable price miners will receive a fairer price for their products. They will also therefore be less likely to smuggle minerals out of the country or operate on the black market.

Links with the 'fair trade' movement could also help to achieve better prices for small-scale miners. Consumers in richer countries are becoming increasingly concerned that the goods they buy may have been produced under exploitative conditions. In response a

number of NGO trading companies are now prepared to pay a premium for guarantees of ethically sound production where they can guarantee that producers receive a fair price for their products. A German NGO, Fair Trade e.V., for instance, has established links with many ethically approved producers – including a women's diamond cooperative in Lesotho, cooperatives producing gold and jewellery in Bolivia, cooperatives producing platinum and other metals in South Africa, and gem producers in Madagascar and Tanzania (Hentschel, T, Hruschka, F, and Priester, M, 2001).

5.2 Encouraging added value

Encouraging "added value" within the production chain provides a means of enabling small-scale miners to generate additional income and will create jobs within the local economy. An example of this is in Bolivia where a successful supply chain for silver has been developed amongst mining communities who are involved in the whole process from mining to the production of replicas of old Spanish silver coins which are sold to tourists in Potosi. Other means of adding value include transforming gold into jewellery, and cutting and polishing gemstones and manufacturing them into jewellery.

ASM can also act as a stimulus for broader economic development and industrialisation through fostering up- and down-stream linkages, which may include small-scale smelters, refineries, metal semi-fabricators and fabricators, and manufacturers.

5.3 Encouraging diversification

Another priority should be to seek ways of minimising vulnerability through developing other employment opportunities and ensuring that mining operations are integrated with existing local economic activities. In doing this the role that mining can play in existing livelihoods needs to be considered. Ideally, mining should serve as a catalyst and anchor for other productive activities stimulating complementary and alternative productive ventures. In the case of permanent full-time or seasonal operations the main priorities will be to find better ways of integrating miners into the rest of the economy and encouraging mining communities to invest their revenues in other forms of economic activity as well as in communal services such as schools, infrastructure and health centres.

Vulnerability to price fluctuations can also be reduced through encouraging diversification in the range of minerals being mined, rather than relying on one specific commodity. The Government of Zambia, for example, is implementing a programme to diversify mining from the traditional copper and cobalt production to other minerals such as gemstones and industrial minerals. Their mining sector diversification programme, funded by the European Commission, is emphasising the role of ASM in the development of gemstone and industrial mineral mining, processing and marketing.

5.4 Taking an integrated approach

Given the complexity of issues surrounding ASM an integrated approach needs to be taken to support and improve the sector, rather than trying to tackle any one challenge in isolation. Broadly speaking any intervention which seeks to develop the ASM sector should indirectly reduce the vulnerability of small-scale miners to price fluctuations.

Governments need to develop appropriate, consistent and transparent policy and regulatory frameworks that focus on both the facilitation and management of ASM. For the framework to be effective, they need to ensure that sufficient financial and regulatory incentives exist for small-scale miners to formalise their activities.

To reduce the vulnerability of small-scale miners more generally they should be supported to gain access to technologies and services, along with training for health and safety and for environmental management. Financial assistance could also be provided to assist small-scale miners to step up to higher levels of productivity and output by mechanising more of their activities and developing new reserves. The impact of price fluctuations can be cushioned through ensuring that there are adequate support mechanisms such as cooperatives and credit unions. In addition, small-scale miners need to be alerted to the effects of their activities on their livelihoods and be encouraged to take steps to mitigate the negative impacts.

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