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Short Note

## Collecting data in artisanal and small-scale mining communities: Measuring progress towards more sustainable livelihoods

Marieke Heemskerk

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### Abstract

*This short note discusses methodological obstacles to the collection of microeconomic data in artisanal and small-scale mining communities. International donor organizations are supporting policy efforts that enhance the contribution to poverty alleviation of this mining subsector. The design and evaluation of such policy interventions require data on income, expenditure, investment, and savings in mining households and communities. These data are difficult to come by. Incomes are variable; migrants may work far from home; miners often work informally and sometimes illegally; mining populations and communities are heterogeneous and transient; and miners have many reasons to distort information. Legalization and organization of miners in cooperatives would facilitate documentation and research. These processes, however, are beyond the control of the typical policy consultant or donor organization. On their part, these parties can adopt an alternative model of research. This model involves the community in project development, data collection, and monitoring. It emphasizes continuity, cultural diversity, trust building and learning. The data thus collected should provide a firm basis for programmes that promote more sustainable livelihoods in artisanal and small-scale mining communities.*

*Keywords:* Artisanal and small-scale mining; Methods; Microeconomic; Policy; Communities and Small Scale Mining (CASM).

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### 1. Introduction

Worldwide more than 13 million men, women, and children are making a living as artisanal and small-scale miners (Jennings, 1999). Their working conditions differ depending on many factors: geographic (e.g., location), geological (e.g., mineral mined), demographic (e.g., sex, age), socio-economic (e.g., alternative employment options), and cultural (e.g., taboos) (Hilson, 2003; Noetstaller, 2004; see Plate 1). Yet small-scale miners in different regions also have things in common. Usually, artisanal and small-scale miners live in poor rural areas of developing countries. Most are not formally trained in mining and have received little education in general. Although they use rudimentary exploration and extraction techniques, mining allows them to earn cash

income for their households, supplement meagre farming revenues, and — in the case of coal — obtain energy.

International donor organizations, including the World Bank and the United Nations, believe that artisanal and small-scale mining (ASM) can contribute to socio-economic development in poor rural areas. Support for policy efforts that could strengthen this contribution was expressed at the United Nations conference on mining held in 2002 in Yaoundé, Cameroon. The Yaoundé Vision Statement recommended that policies and programmes directed towards the subsector should contribute to sustainably reduce poverty and improve livelihoods in artisanal and small-scale mining communities (UN, 2002).

To evaluate the success of the aforementioned policies and programmes, one must be able to detect whether mining communities are moving from poverty into well-being. This short note discusses methodological guidelines that can help achieve this objective — given a policy assignment (e.g., for the World Bank) with a restricted timeframe of one to two months. Using two analytical models, the article first discusses what microeconomic data are most critical to poverty alleviation strategies in ASM communities (see also Noetstaller *et al.*, 2004). Next, it identifies obstacles to the

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Hydraulic gold miners in Suriname, South America.



Sand miners in Ghana, West Africa.



Manual salt miners in Ghana, West Africa.

**Plate 1.** A glimpse of the diversity among artisanal and small-scale miners.

collection of microeconomic data from small-scale resource-based economies based on case studies and field experience (see also Hilson and Maoponga, 2003). The article then recommends strategies to overcome these barriers, including a change in research philosophy. This change encompasses a transition towards working with community members as participants and partners in development, rather than as mere sources of information. While focused on mining, these results are relevant to other extractive activities by small-scale producers who operate on the sidelines of the formal economy.

**2. Approach: A CASM working session**

This note presents the results from a working session on ‘the microeconomic context of artisanal and small-scale mining’ at the 2003 annual meeting of Communities and Small Scale Mining (CASM). CASM is a multi-donor networking and coordination facility, which operates under the auspices of the World Bank. Its aim is to share knowledge and experience related to ASM and its role in sustainable development.

Participants from 14 different countries attended the microeconomics session in Accra, Ghana (see acknowledgement at end of this note). The group included representatives from government, universities, non-governmental organizations, and international development institutions. All attendees had collected, analyzed, and/or used data from ASM communities. The following questions motivated the working session and are also central in this short note:

- What microeconomic data are necessary as a baseline for policy interventions?
- What obstacles hinder the effective collection of these data?
- How can we improve data collection?

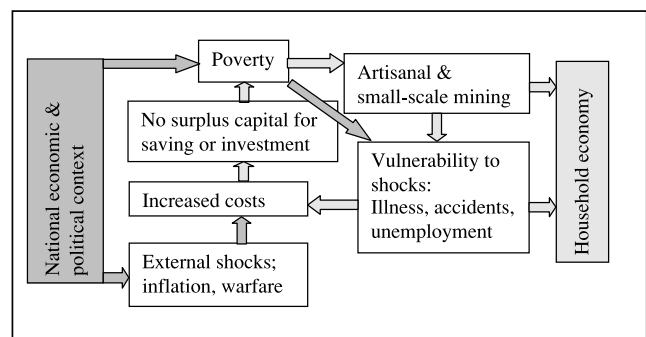
**3. What microeconomic data do we need?**

Artisanal and small-scale miners are typically poor and have remained poor despite working as miners for many years.

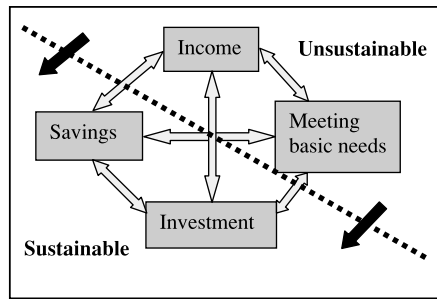
Many make barely enough money to establish and support a family. Their poverty produces and is perpetuated by vulnerability to shocks: unexpected events that trigger a decline in well-being, such as illness and accidents. By causing unpredictable fluctuations in household earnings and consumption, adverse shocks can pull poor families into a downward spiral towards destitution. Shocks also paralyze efforts to plan for the future, for example by forcing families to take children out of school.

Unhealthy and hazardous labour conditions in mines increase the chances of experiencing shocks and paralyze coping strategies. Injuries, for example, inflict medical costs and cause loss of working days. Income variability limits access to formal credit systems, and small-scale miners therefore often have to make unprofitable deals with informal creditors. Furthermore, few miners earn enough to invest in education, more efficient technology, and other assets that would allow their families to advance. These factors keep ASM households trapped in a vicious cycle of poverty and vulnerability (Figure 1).

Breaking the poverty cycle requires that households build resilience to shocks by taking precautionary measures (e.g., using safety gear) and by strengthening their coping capacity (e.g., enrollment in a health insurance plan). Poor households will remain unable to adopt such strategies, unless they move from an economy where all income is



**Figure 1.** Artisanal and small-scale mining households are trapped in a vicious cycle of poverty and vulnerability to shocks.



**Figure 2.** Moving to a microeconomic environment that emphasizes savings and investment.

*Source:* This model was developed at the CASM microeconomics workshop by S. Mondlane, A. Pedro, and P. Andrews-Speed, 6 September 2003.

spent on basic needs to one that allows for savings and investment (Figure 2). Donor organizations aiming to support and monitor this transition need data on income, expenditure, investment, and savings.

### 3.1. Household income

Household income includes money, assets, and products that enter the household and can be consumed. Non-cash income comes from gardening, fishing, hunting, mining, barter, and other activities. It is difficult to estimate the dollar-value of non-cash income, which is usually variable and not recorded. Instead, policy-makers usually work with indicators. The most useful indicators are those that are comparable and replicable. That is, the number of TVs is not a good indicator to compare the relative wealth of two villages if one village does not have electricity. Also, tracking progress towards a goal requires that the measure can be repeated in a following year or in a control site. Frequently used income indicators include the presence and quality of transport vehicles (e.g., bikes, boats), ownership of electric appliances (e.g., radio, refrigerator), and various measures of housing conditions.

### 3.2. Expenditures

Expenditures express the (dollar) value of daily life necessities, such as food, services, and consumer durables, that are immediately consumed by the household. It is difficult, and for most purposes not necessary, to record reliable absolute data on household expenditure. Comparing expenditures will be possible using culturally appropriate indicators. For example, one can record how much of a popular product (e.g., soap, meat) has been purchased. Alternatively one can ask about the acquisition of more expensive necessities, such as shoes and clothing, over the past year.

### 3.3. Investment and savings

Expenditures are considered an investment if their consumption is delayed with the expectation of higher returns

in the future. Sending children to school is an investment even if education is free, because parents need to buy school uniforms and books, and forego the labour contribution of their children. Other popular forms of investment in ASM communities are mining equipment (e.g., a hydraulic mining machine) and alternative income generating activities (e.g., setting up a store). Savings can be stocks of money — in cash or a bank account — but also cattle, jewelry, and other valuables. Savings can take different forms, depending on the culture; what is considered valuable in one place may not be relevant or valued somewhere else.

## 4. What obstacles hinder data collection in ASM communities?

- *Production variability.* Production variability complicates the estimation of income averages. A small-scale gold miner in Suriname may earn 50 g of gold one month, but only 5 g or nothing at all in a following month (Heemskerk and Oliveira, 2003).
- *Income variation.* The earnings of an individual miner may fluctuate, and variations between ASM operations in different areas can be even more significant. Thus, a diamond miner in Sierra Leone may discover a stone worth more than US\$500 in one lucky strike, while a manual salt miner in Ghana will earn only a fraction of this amount over a period of a month.
- *Poor field records.* Small-scale and artisanal miners usually are not formally trained in mining and may have received little education in general. As a result, few ASM operators keep (adequate) records of their earnings and investments.
- *Miners fear government interference.* The greatest number of small-scale and artisanal miners work on the sidelines of the formal economy. Informal and (semi) illegal miners are likely to hide their earnings and whereabouts because they fear that they will be chased away, that their work site or material may be confiscated by the government, or that they will be assessed for taxes (Heemskerk and Oliveira, 2004).
- *Miners distrust outsiders.* Because of their lack confidence in the good intentions of the government and researchers, miners may not reveal that they employ clandestine labourers, sell their production outside legal channels, and violate national labour, environmental, and other regulations.
- *Mining income cannot be isolated.* Income from small-scale mining is difficult to quantify, as it cannot be isolated from the household's other income generating activities. Mining revenues may support other activities and income from other sources may be invested in mining equipment or travel to the mines. Smallholder farmers in the Brazilian Amazon, for example, migrate to the gold mines during the agricultural slack season to earn extra income. Income from mining permits them to purchase items

they normally could not afford, pay off debts, or mitigate specific household shocks, such as harvest failure (MacMillan, 1995).

- *Heterogeneity.* The significant heterogeneity of the small-scale mining sector complicates the development of generalized conclusions and recommendations about the ASM population. Such diversity even characterizes miners of the same mineral within one country. The smallholder farmers mentioned above, for example, may share an alluvial deposit with more organized and mechanized teams of professional small-scale gold miners. Yet other mining teams, working just a few miles away, may use dynamite to access primary ores at greater depths (Hinton *et al.*, 2003; MacMillan, 1995).
- *Miners are transient.* The mobile and transient nature of especially migrant ASM populations complicates study replication. A transitory diamond miner may follow promising stories to one region today, and move elsewhere tomorrow if earnings are disappointing or the working conditions unfavourable. Also, assessing the contribution of mining to household and community well-being is difficult when migrant miners originate from a range of far-away geographic locations.
- *Dangers to researchers.* Violent crime, drugs, the illicit use of fire arms, and related illegal activities make it dangerous for researchers to visit and collect data on certain mining sites, especially where gold and diamonds are mined. Researchers that rely on personal interviews and observations by participants often face precarious conditions, especially if they work in conflict zones, such as Sierra Leone or the border region between Angola and the Democratic Republic of Congo (de Boeck, 2001).
- *Cultural barriers.* Social and economic relations in artisanal and small-scale mines are shaped by cultural beliefs and practices that may or may not be adequately understood by a short-term foreign consultant. For example, traditional customs and taboos may prohibit mining in specific places (e.g., sacred coves) or on certain days of the week. Indigenous miners in various countries and regions ban women from underground mines because they believe their presence will bring bad luck.

## 5. Methodological and infrastructural changes to improve data collection

Data collection in ASM areas is likely to gain from several methodological, institutional, and infrastructural changes, such as:

- *Legislation, registration and organization.* Legalization, registration, and organization of small-scale miners will help establish a database with information on the number of miners with their demographic, ethnic and geographic background, technology used, and production. Formal-

ization also invites more open communication as it reduces the perceived need for secrecy.

- *Interviews with key informants.* Where accurate numeric information is difficult to obtain, qualitative methods can be relied on, such as focus groups and interviews with key informants. For example, if miners are secretive about their personal production, a reasonable estimate can be gained in a group discussion of the range of wages.
- *Cultural sensitivity.* Data quality will improve if the researcher has prior experience with the target area and culture. Knowledge of local rules of conduct and communication is necessary for the researcher to be able to ask pertinent questions, obtain reliable and valid answers, and interpret these answers correctly (Noetstaller *et al.*, 2004). Crispin (2003) describes an outreach programme for miners in Papua New Guinea that relies on story telling as a vital part of traditional rural community life and transmission of information.
- *Relationships of trust.* The endorsing institution should provide the researchers with sufficient time to establish relationships of trust with the target community.
- *Endorsement by local community leaders.* International consultants should seek endorsement from local community leaders and work with local researchers and organizations.
- *Clearly defined purpose.* The study being undertaken should have a clearly defined purpose. People in the community must understand this purpose and know who requests the data being collected. If the objective of the study is long-term development of the community, it is preferable that the local community should be consulted at the planning, performance, monitoring, and evaluation stages.

The last four points argue for a participatory model of research (Table 1). In the earlier, top-down model, the research is defined, designed, and conducted by the implementing agency alone. Community members only provide information and an outside team of researchers analyzes the data to develop a policy strategy. In practice, top-down methods still continue to dominate, as illustrated by the following example. In the summer of 2004, a mercury researcher collected fish samples in a Latin American indigenous community. The researcher did not inform community members who he was and what he was doing, nor ask village authorities for permission to catch the fish. There are numerous similar examples, as well as cases of research teams that do not include any local people, and of research results that never reach the community concerned.

The proposed participatory research model integrates questions, concerns, ideas, and actions from the local community. Community involvement can take various forms. Researchers may work with local miners to design a survey format and discuss the results. At the maximum level of participation, community members are involved as equal partners in project planning, implementation, and evaluation.

**Table 1. The top-down and the participatory models of research**

	Top-down research model	Participatory model of research
<b>Researchers</b>	Outside consultant team.	Team that includes local people and/or people familiar with the local culture.
<b>Time commitment</b>	Short time-frame, usually less than two weeks, which allows for data collection only.	Extra time is reserved for establishing trust, and discussing the project and the results with local stakeholders.
<b>Community involvement</b>	Community members are asked to provide data. The data-sheet and study design have been developed in advance.	Community participation might include: <ul style="list-style-type: none"> <li>• Help in the design of survey tools</li> <li>• Employment as research assistants</li> <li>• Involvement as equal partners in project planning, implementation, and evaluation.</li> </ul>
<b>Community authorization</b>	Researchers have outside authorization (e.g., from the government) and do not inform or ask permission from local authorities, such as tribal chiefs.	Researchers meet with community leaders to discuss the aims of the study and the conditions under which data collection is to take place.
<b>Goal setting</b>	The requesting agency has set a fixed goal that serves its purpose.	Community members have a say in (some of) the objectives of the study.

Several ongoing development initiatives, including the United Nations Development Programme project on artisanal mining and sustainable livelihoods (UNDP, 1999) and the International Development Research Center's Mining Policy Research Initiative (MPRI/IIPM, 2003) have invited some degree of community participation with positive results.

Does it really matter what research model is used? Will policy-makers obtain better data and will, at the end of the day, miners be better off? Research experience in the field confirms the first point. Data collection improves with: longer stays in the communities; formal and informal communication with community leaders and other members; consultation with small-scale miners about appropriate questions and indicators; the participation of local research partners and assistants; and return visits.

Evidence suggests that miners also fare better under the participatory model. Examples are found in the various environmental health projects with gold miners, many of which focus on mercury contamination. Artisanal and small-scale gold miners use mercury, which binds with gold to form an amalgam, to separate gold particles from the soil. The gold is retrieved by burning the amalgam over a fire to let the mercury evaporate. Many families burn the amalgam in their kitchen and living areas — sheltered from the curiosity of fellow miners and criminals. This practice presents a health risk to family members, including young children, as toxic vapors are inhaled and food is contaminated. Also, when mercury leaches into surrounding river ecosystems, it contaminates fish and thus affects the health of those community members who eat the fish.

The Government of Ghana has launched a programme to educate small-scale miners about safer ways to use mercury (Logan, 2004). In order to facilitate communication with the miners and to design a programme that meets their needs, public officials have been urging miners to legalize and organize themselves into cooperatives. In Papua New Guinea, an outreach programme with miners has success-

fully persuaded families not to burn the poisonous mercury-gold amalgam in their kitchen and living areas (Crispin, 2003). A study on heavy metal contamination caused by small-scale gold mining in Ecuador has prompted the formation of a local environment group (Waldick, 2003). Group members are educating fellow community-members about mining-induced health hazards and are drafting a new regional environment code.

In the above examples and in many other cases, local participation has benefited the health and well-being of miners, their families, and the inhabitants of surrounding communities. Future policy initiatives are encouraged to follow in their footsteps on the route towards more sustainable livelihoods in ASM communities.

## 6. Conclusions

People engage in mining for a variety of reasons. They are unable to find other work, other jobs pay insufficiently and their low educational status limits access to better paying jobs. Members of traditional mining families may attach themselves through mining to a cultural community. Gold rush miners may be lured by prospects of striking it rich. Regardless of their reasons for entering mining, most miners hope that the activity will help them improve their — usually marginal — position in society.

International donor organizations may contribute to the transformation of the ASM industry into a more sustainable livelihood activity. Microeconomic baseline data are indispensable to policy efforts in this endeavour, but several barriers hinder the collection of information on income, expenditure, savings, and investment in ASM communities. Informality and illegality, income variability, the transient and fluctuating nature of mining populations, heterogeneity within and among mining communities, and cultural variation are among the hindrances.

Legalization of the mining activities and miners organizing themselves into cooperatives or associations will facilitate data collection by implementing a formal documentation system. Such political changes require the active support of both national Governments and the miners. In terms of methodology, there is a need for a change in the model of research. In the old model, outside researchers retrieved data without involving the community except as provider of information. The new model entails participation of the community in project development, data collection, and monitoring. It emphasizes continuity and follow-up, and recognizes the importance of building trust and engaging a process of learning, both by the researcher and the community — all of which takes time.

Lastly, culture and tradition shape the microeconomic context of small-scale gold mining and deserve more attention in baseline studies. Explicit recognition and study of cultural diversity within and between villages may help researchers understand why certain policies are successful, while others fail to achieve their objectives. It remains a challenge to collect valid and reliable microeconomic data, and translate these data into policies that can help build more sustainable livelihoods in ASM communities.

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Several other people spontaneously joined the working session on both or one of the two days.

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