



**Organisation of African Geological Surveys**

**Organisation de Services Géologiques Africains**

**Organização de Serviços Geológicos Africanos**

# **ORGANIZATION OF AFRICAN GEOLOGICAL SURVEYS (OAGS)**

## **DRAFT DOCUMENT**

### **ON**

# **THE ROLE OF GEOLOGICAL SURVEYS IN ARTISANAL AND SMALL-SCALE MINING**

## **GHANA - NIGERIA EXPERIENCE**

**AUGUST, 2014**

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## **1.0 Introduction**

In many developing countries, artisanal and small-scale mining (ASM) is largely a poverty-driven activity which plays an important economic role. Small-scale mining for valuable minerals has been a desirable venture for many people for centuries.

Artisanal and Small-scale mining(ASM) is currently seen globally as a source of subsistence for the poor, especially developing countries and as a determinant of environmental degradation and resource depletion in areas where such precious minerals are mined. It is labour intensive and thus provides employment and incomes to large numbers of people who are generally uneducated, poor and live in remote areas where no opportunities exist for formal employment.

The term artisanal and small-scale mining refers to all formal and informal, manual and semi-mechanized mining that uses crude methods to extract minerals from secondary and primary ore bodies.

Small-scale-mining is commonly associated with informal, unregulated, under-capitalized and under-equipped mining operations, where technical and management skills are lacking, considered as a determinant of environmental degradation and resource depletion in areas where such activities are carried out since mining activities are mostly carried out by non-educated people with little knowledge of the environmental and health hazards related to their activities.

While small-scale mining can lead to wastage of non-renewable resources and can be hazardous to human and environmental health, it can also contribute to national economies and economically empower disadvantaged groups by virtue of its low investment costs and short lead time from discovery to production.

The major stumbling blocks to socio-environmental sustainability within the small-scale mining sector are poverty, population pressure on natural resources, as well as lack of knowledge. The activity is extremely environmentally damaging and often has serious health and safety consequences for workers and surrounding communities. This is generally due to poor practices in mining and processing of target minerals.

Governments in many countries regard ASM as an illegal activity. This classification poses a huge challenge in the effective and efficient coordination of their activities. The consequent lack of an adequate regulatory and policy framework prevent the formalization of this sector. This, in turn, makes improvements in the livelihoods of miners and their dependent communities difficult to achieve. The absence of formalization also makes improvements in environmental performance much more problematic.

Many of the potential economic benefits of the small-scale mining sector are lost through poor practice in mining, processing and marketing of target minerals. The absence of adequate legal frameworks and secure rights for miners and communities exacerbates this problem. Local governance structures and institutions are typically underdeveloped. Artisanal and small-scale miners are often marginalized and there can be very serious disputes with communities, government agencies and large-scale mining interests. Conflicts over access and land-use can be a particular issue in areas where indigenous or tribal peoples have traditional land rights or land-use patterns. These and other problems commonly associated with ASM (such as child labour, access to health care and education) present a major challenge to government and regulatory authorities in countries where these activities take place, as well as to the wider development community.

This document attempts to identify the role Geological Surveys could play to help governments and various stakeholders find amicable solutions to some of these problems associated with the activities of artisanal and small-scale mining.

## **2.0 Definitions of Small-Scale Mining**

- Artisanal and Small-scale Mining (ASM) refers to mining by individuals, groups, families or cooperatives with minimal or no mechanization, often in the informal (illegal) sector of the market.
- Small-scale mining refers to all formal and informal, manual and mechanized mining that uses crude methods to extract minerals from secondary and primary ore bodies.

- In some countries, a distinction is made between 'artisanal mining' that is purely manual and on a very small scale, and 'small-scale mining' that has some mechanization and is operated on a relatively larger scale.
- The local definitions of ASM vary from country to country depending on the macroeconomic situation, the geological framework, the mining history and the legal conditions.
- In Nigeria, artisanal mining refers to mining by any method not involving substantial expenditure by an individual or group of persons not exceeding nine (9) in numbers or by a co-operative society made up of ten (10) or more persons.
- United Nations (1972) defined small-scale mining as "any single unit mining operation having an annual production of unprocessed minerals of 50,000 metric tons or less, as measured at the entrance of the mine".

Hence the definition of small scale mining is based on a number of criteria, and these include:

- The number of persons employed. This threshold varies from country to country;
- The size of the concession lease, taking into account that some miners are mining without any concessions;
- The size of the reserves;
- The productivity capacity of the mine;
- The productivity of the mine in terms of output per employee per unit of time;
- The gross annual income;
- The degree of capitalization or mechanization, noting that micro-scale mining utilizes simple tools with no mechanical energy, and at a higher level some mechanical equipment is employed;
- The continuity of the mining operation;
- The requirements of mine safety and legislation.

## **2.1 Criteria used in the definition of Small-Scale Mining across Africa**

The criteria used in the definition of small-scale mining across Africa are presented in the Table below:

<b>Country/Organization</b>	<b>Criteria</b>
Cote d'Ivoire	Level of mechanization
Ethiopia	Annual production, level of mechanization
Ghana	Capital investment, number of participants
Guinea	Type of minerals exploited
Nigeria	Level of formalization, size of concession area and capital investment
Senegal	Depth of working, crude production levels
South Africa	Capital investment
Tanzania	Capital investment, labour and technology requirements
United Nations	Annual production capacity
Zambia	Size of concession area
Zimbabwe	Size of concession area, capital investment

The world over, small-scale mining can be divided into three basic types:

- **Artisanal** - involving the use of simple tools and the absence of a formal enterprise (e.g. Galamsey);
- **Traditional** - includes licensed and registered non-mechanized or semi-mechanized mining operations run by individual or organized cooperative societies;
- **Advanced** - involves the legally constituted small-scale mining companies that are highly organized and utilize advanced equipment and mining methods.

### **3. Benefits of Artisanal and Small-Scale Mining**

#### **3.1 Artisanal Mining:**

- Is globally seen as a source of subsistence for the poor, especially developing countries;
- Offers opportunities to support rural livelihoods;
- Develops entrepreneurship;
- Provides a source of industrial raw materials for many industries;
- Is usually considered a last resort to escape poverty and unemployment;
- A way to fight poverty.

#### **3.2 Small-Scale Mining:**

- Provides a source of industrial raw materials for many industries;
- Contributes to local and foreign exchange earnings;
- Encourages foreign direct investment and boosts the country's economy;
- Is estimated to provide direct and indirect employment;
- Develops entrepreneurship;
- Is usually considered a last resort to escape poverty and unemployment;
- A means of reducing migration of able bodied people to urban areas;

#### **3.3 Artisanal and Small-Scale Mining:**

- Provides the economic means for survival for a substantial part of the global population, especially those with limited alternatives;
- Increasing numbers of people turn to it to seek alternative livelihoods, particularly in marginal areas with limited economic alternatives. In many cases, this is impelled by growing economic crises, (which increases unemployment), and decreasing rural livelihood choices, exacerbated by natural (mainly droughts and floods) and man-made disasters (e.g. conflicts).



- It is estimated that 13 to 20 million people worldwide work in this sector, while another 80-100 million depend on it for their survival.
- In Africa, about 3.7 million are directly engaged in this sub-sector and about 30 million depend on it.

#### **4. Typical Problems associated with Artisanal Small-Scale Mining**

##### **4.1 Geology:**

- Lack of appropriate ore bodies
- Lack of information about these ore bodies

##### **4.2 Law:**

- Discouraging investment climate
- Illegality of ASM
- Lack of political and legal stability
- Difficulties of legalizing mines
- Contradictions between different/official acts

##### **4.3 Marketing:**

- Access to the market only via intermediaries
- Market barriers
- Market regulations

##### **4.4 Finance:**

- Difficulties in low-cost preparation of feasibility studies
- Uneconomical investment decisions
- Lack of bookkeeping and cost-calculation
- Lack of capital
- High tax and royalty burden
- Limited access to investors and equity capital

#### **4.5 Technology:**

- Use of labour-intensive technology
- High losses of value and time
- Lacking transparency of the hardware market

#### **4.6 Human Resources:**

- Unskilled labour force
- Lack of written contracts
- Social dependencies
- Lack of cultural understanding
- Bad social image of mining
- Subsistence economy
- Lack of knowledge about economic principles, credit and finance aspects
- Gambler mentality
- Access to foreign experts limited

#### **4.7 Organization:**

- Lack of umbrella organizations
- Lack of service offers by Government Organizations
- Seasonal activity of artisanal miners
- Difficult coordination or cooperation due to widespread out mine locations.

### **5.0 Frame Work Elements of Artisanal and Small-Scale Mining**

- Mineral Clinics - Geoscience and Social Interface. This is the first and open contact with the entrepreneur.
- Review of existing data
- Database Management
- Basic mapping of Sites at a scale of 1: 10000 or 1: 5000
- Geophysical Surveys – Resistivity, VLF-EM
- Laboratory Services- Petrography, Chemical Analysis
- Mineral Economics

- Primary Resource Estimation
- Simple Beneficiation
- Other Technology Input
- Capacity Building
- Thickness of overburden
- Geochemical Sampling

## **6.0 Constraints on Small-Scale Mining – Policies and Strategies for Development**

### **6.1 Level of Development:**

- The unemployed rural populace could hardly bear the capital or technological costs required to develop proper mining cultures due to low incomes resulting in illegal artisanal mining.
- The low level of development leads to a large number of the unemployed that engage in illegal mining as a means of livelihood.

### **6.2 Taxation:**

- Numerous uncoordinated taxes and levies are paid to the Government, Municipal/District Assemblies, Chiefs and Landowners.

### **6.3 Geological Information:**

- Little or no geological information on occurrences of most minerals are known to the small-scale miners.
- People's decisions to start mining are based on speculations.
- Many small-scale miners operate in areas where mineral explorations have not been carried out.

### **6.4 Land Ownership:**

- Most plots allocated are too small for mining.

- Most operators have licences to engage in mining operations but have no leases for their plots of land (they are tenants and not landlords).

### **6.5 Securing Finance:**

- It is difficult to secure finance from financial institutions and banks for lack of collateral.
- Miners are mostly financed by rich individuals who expect nothing other than higher returns.
- When loans are secured from banks, interest and inflation rates are usually too high.

### **6.6 Illegal Mining Markets:**

- Frequently patronized by local and foreign marketers. The revenue lost to illegal mining could be used to resuscitate the mining sector.
- Buyers form cartels to offer uniform prices inhibiting mine operators from obtaining value for their products.
- Miners prefer to deal illegally and get higher profits as opposed to merging as small-scale miner groups.

### **6.7 Growing Antagonism between Small-Scale Miners and Large-Scale companies**

- Proliferation of large-scale exploration and mining companies in some cases limits the operation grounds of small-scale indigenous miners resulting in clashes which undermine international investor confidence.

### **6.8 Lack of Policies and Awareness:**

- Most African countries lack policies guiding:
  - Documentation of Mining Practices;
  - Code of Conduct and Mining Practice;

- Child Labour and Women Miners;
  - Training and Development of Miners;
  - Mining Research;
  - Financial Guidelines and
  - Environmental Regulations.
- Poor management of the mining sector and in-house management of small-scale miners contribute to poor performance of the mining sector.

### **6.9 Lack of Technology and Machinery:**

- Lack of modern technology, crucial to safe and effective mining and
- Inadequate technological expertise

Small-scale mining cannot be carried out as a sustainable activity as it is associated with a lot of impacts. Notably amongst them are social, environmental and health impacts.

## **7.0 Social Impacts of Small-Scale Mining**

The major social impacts are:

- over population
- family disorganization
- increase in school drop outs
- prostitution
- drug abuse
- high cost of living
- infrastructural breakdown

## **8.0 Environmental Impacts of Small-Scale Mining**

The numerous environmental impacts of greatest concern are:

- indiscriminate use of hazardous chemicals like mercury and cyanide

- direct dumping of tailings and effluents into streams and rivers
- threats from improperly constructed tailings dams
- river siltation
- erosion damage and deforestation
- landscape destruction
- dewatering effects
- noise and vibration

## **9.0 Health Risks Associated with Small-Scale Mining Activities**

The health risks include:

- respiratory tract diseases, especially pulmonary tuberculosis and silicosis from crushing of rocks;
- rheumatism from standing in cold water without proper boots and clothing;
- mine sites are breeding grounds for water borne diseases such as malaria , schistosomiasis, onchocerciasis and bilharzia;
- women miners that come into contact with chemicals that develop health risk to fetuses and breast-feeding infants;
- skin rashes, headaches, vomiting, diarrhea;
- drug/alcohol abuse, prostitution leading to spread of AIDS, rape, theft and sexual abuse;
- eye diseases, especially acute conjunctivitis.

## **10.0 Policies and Strategies for Development:**

### **10.1 Credit and Loan Schemes:**

- It is vital for more commercial and merchant banks, credit and loan houses and other financial institutions to develop loan schemes to assist small-scale miners.
- Providing access to much needed funds at affordable and competitive pay back rates - fundamental key to boost small-scale mining.

- Government should provide incentives to the financial institutions such as concessions from the Central Bank like tax cuts.
- Small-scale miners should be offered a range of measures to facilitate access to credit, which may include:
  - cooperative savings;
  - pooled equipment leasing arrangements and
  - concessional lending schemes (with special support funding from international sources).

### **10.2 Building Appropriate Legal and Regulatory Frameworks:**

- Must be transparent, consistent, and non-discriminatory, and
- Should offer people easy access to mining titles and legal channels for production.

### **10.3 Offering Incentives for Regularization:**

- Include:
  - tax allowances for new enterprises;
  - exemptions from import duties on mining and related equipment or supplies;
  - access to finance and
  - assistance with exports.
- Penalties and punishment (fine and prison terms) dealing with illegal mining activities and environmental pollution laws should be reviewed in order to substantially discourage illegal mining.
- Organizing ASM into cooperatives.

### **10.4 Creating Necessary Services:**

- Government should organize services that meet miners' real needs – legal, organizational, technical, health and safety.

- Rendering extension services to ASM

### **10.5 Ensuring Coherent Administration:**

- Government should:
  - ensure that all the relevant Ministries – Finance, Lands & Natural Resources/Mines, and Environment, Science & Technology – coordinate their policies;
  - endeavour to decentralize as many activities as possible to ensure that they mesh with other strategies for promoting rural development.

### **10.6 Integrating Small-Scale Miners into Formal Mining Sector:**

- Policies should be created to integrate small-scale miners into the sector by way of developing specific mining engineering and management courses by local universities & institutions (e.g. University of Mines & Technology (UMaT), Tarkwa), School of Mines (Zimbabwe), Institute of Mining Research (Zimbabwe), Institute of Mining and Geosciences, Jos, Nigeria) in collaboration with foreign institutions, to produce competent technical staff and management.
- It is essential for all ASM Cooperatives and Small-scale miners to be technically proficient in adequate managerial skills.
- Proper documentation (data management) of all Artisanal and Small-scale mining activities by Ministry of Mines and Steel Development is vital to the progress of the sector.

### **10.7 Minerals Market:**

- Create a viable minerals market (e.g. Minerals Buying Centres, Nigeria; Precious Minerals Marketing Company, Ghana; Minerals Marketing Corporation,



Zimbabwe, etc) and properly manage private buying centres and licensed buyers to generate a large proportion of earnings from small-scale mining.

#### **10.8 Small-Scale Miners Associations, Co-operatives, Miners Federation, etc:**

- Governments should encourage such associations like Miners Association of Nigeria Miners(MAN), National Small - Scale Miners Associations, Federation (Zimbabwe), - as a forum for development.
- Various Chamber of Mines should encourage artisanal and small-scale miners to form federations that could have representation at the Chamber level.
- Artisanal and Small-scale miners may improve their lot technically and could access financial support if they form co-operatives, companies and enterprises and also if they consider more linkage effects with other sectors of the economy.

#### **10.9 Small-Scale Mining (SSM) Division/Department:**

- Creating a ASM Division/Department under Government Ministry and Minerals Commissions solely in charge of ASM activities will go a long way in ensuring adequate attention and enhanced proper and adequate development of the sector.

### **11.0 Role of Geological Surveys and other Relevant Bodies in Small-Scale Mining Activities to Overcome Constraints and Mitigate against Environmental Degradation & Health Risks**

#### **11.1 Role of Geological Surveys & Minerals Commissions:**

Geological Surveys & Minerals Commissions should:

- Intensify education to the rural populace through TV and Radio talk shows and seminars;

- Dedicate commitment towards uplifting communities by providing them with guidance, advice and geological support towards the establishment of a better society;
- Support the artisanal and small-scale miners through research and development of appropriate technologies and training;
- Collaborate with the Municipal and District Assemblies and organize training courses for small-scale operators who have little or no knowledge of small-scale mining but are either involved, or negotiating to be involved in mining.
- Assess conditions for artisanal and small-scale mining.
- Organize training courses in basic geology; surveying, mineral processing, environmental management and reclamation for artisanal and small-scale miners to enable them improve the ore recovery with less damaging impact on environment and health.
- Hold regular Geology clinic as a platform for educating the artisanal and small-scale miners of the different mineral resources of the country.
- Provide legal advice to Government and local authorities to support the activities of artisanal and small-scale miners.
- Encourage small-scale miners to use equipment like the “Sika Bukyia” (gold smelting gas stove used in Ghana) to reduce the use of mercury in gold recovery.
- Encourage artisanal and small-scale miners to go into agro geology by providing them with information on locations of suitable local mineral-based deposits and organic ingredients. They can blend these to form low-cost soil ameliorants or modifiers, which could be used as fertilizers.

### **11.2 Small and Medium Scale Industries Equity Investment Scheme (SMIEIS), etc:**

- Mining sector should be given priority for equity investment by a number of banks with the introduction of:
  - SMIEIS (Intercity Bank, Nigeria) and

- Small Scale Mining Credit Guarantee Scheme (Nigeria) - a form of venture capital, whereby mining firms stand to benefit from the banks' expertise and encourage funding from foreign investors.
- Solid Minerals Development Funds.

### **11.3 Minerals Commissions, Mineral Resources Committees and Mining Promotion & Development Departments:**

- Minerals Commissions, Mineral Resources Committees and Mining Promotion & Development Departments should be established to oversee and control the activities of the mining sector and also to formulate policies governing artisanal and small-scale mining activities.

### **11.4 Mining Support Service Companies:**

- Mining Support Service Companies should be encouraged to provide:
  - technical assistance in mineral exploration;
  - contract mining and minerals processing and
  - financial and managerial support to artisanal and small-scale miners.

### **11.5 National Awards Scheme:**

- The introduction of National Awards Scheme in artisanal and small-scale mining sector will help curb the menace as there is a higher rate for their improvement via competition.

### **11.6 Environmental Regulations and Penalties:**

- Structure environmental provisions in such a manner to discourage illegal mining.
- Penalties should range from regulations to fines and imprisonment for non-compliance.

### **11.7 Mining Incentives:**

- There should be 100% local ownership of ASM
- Withholding Tax (5% as in Nigeria)
- Minimal Windfall Tax
- Import duty waiver on imported mining related machinery
- Tax holidays of 3-5 years (Nigeria)
- Extension of infrastructure such as roads and electricity to mining sites

#### **11.8. Adequacy of Government's Efforts:**

- Severe punishment of offenders
- Revocation of mining licences of incompetent miners/ companies
- Availability of financial credit and loans

#### **12.0 Recommendation and Conclusion**

Artisanal and Small-scale mining brings several benefits to developing countries, manifested mainly as employment, revenue and foreign exchange earnings. Artisanal and Small-scale mining plays a major role in poverty alleviation and has a greater impact on the economy judging from the amount of people engaged in this activity.

Artisanal and Small-scale mining, therefore, has a major impact on the employment situation in the developing world, especially in rural areas where there are few alternatives.

The major stumbling blocks to socio-environmental sustainability within artisanal and small-scale mining sector are poverty, population pressure on natural resources, and lack of knowledge.

The enactment of relevant legislation and effective legalization of artisanal and small-scale mining can have positive impact on economies of developing countries. To sustain the industry calls for the networking of all key organizations in the mineral sector.

Formalizing their operations will eliminate illegal smuggling channels leading to complete capture of mined product. The policies and strategies will work if they are closely regulated and adequate funding and legal backing are established

Geological Surveys should continue to provide the needed information to enable artisanal and small-scale miners operate more efficiently and economically. A good network and sound financial support would encourage Geological Surveys to continue prospecting so that the mineral inventory available for artisanal and small-scale mining would be enlarged.

Minerals Commissions/Ministries of Mines should also provide and promote innovative technology transfer, industrial growth and human development to the artisanal and small-scale miners to facilitate their empowerment and sustainability.

Additionally, Geological Surveys should enjoy assistance from local governmental and non-governmental bodies and academic institutions to enable improvement upon environmental performances of artisanal and small-scale miners.