

Addressing Small-Scale Gold Mining Problems in Ghana

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ABSTRACT: Small-scale gold mining in Ghana is characterised by lack of capital asset and minimum use of advanced technology, especially during the beneficiation of the minerals into finished products. The industry is also associated with degradation of the land and stream pollution from spillage of chemicals including mercury compounds. The paper addresses some of the problems associated with small-scale gold mining operation in Ghana. The strategies proposed are aimed at providing the appropriate technology to better manage the environment. These include establishment of cooperative ventures with reasonable technical backing provided by the local research groups.

I INTRODUCTION

In Ghana, small-scale mining is defined as any mining operation in which explosives are not used and operated by an individual on less than 25 acres of concession or groups not exceeding nine or cooperatives of 10 or more people (Ntibrey 2001). Such operations in Ghana include diamond, gold, limestone, silica and stone quarry. Small-scale mining in Ghana is traditionally manual, with very low technology. The PNDC Small-Scale Gold Mining Law, 1989 (PNDC 218) brought the activities of illegal gold miners into the formal economic sector of the country. Under the PNDC 218 Part 1(2), any Ghanaian over eighteen years old can apply for a licence to operate a small-scale gold mine. The law expects the licensed small-scale gold miner to mine by an effective and efficient method and shall observe good mining practices, health and safety and pay due regard to the protection of the environment. Unfortunately, these are words and not actions. The structure for the implementation of PNDC 218 initially developed around an implementation Committee comprising of Minerals Commission, Geological Survey, Mines Department and the Precious Mineral Marketing Corporation. The Committee determines long-term policy and monitoring and the performance of project personnel. The day-to-day activities are coordinated by a network of field staff whose functions are coordinated by Project Director at the office of Mineral Commissions.

2 ACQUISITION OF MINERAL RIGHTS

Concessions with minable reserves are unknown to small-scale gold operators owing to lack of availability of exploration data. As such gold exploration and mining is done on trial and error basis. Several pitted, trenched or excavated areas such left unfilled and the land unclaimed because during the preliminary exploratory stages such concessions are barren and not minable. These abandoned pits without reclamation are usually environmentally unfriendly. The number of abandoned pits can be reduced if the country's Geological Survey and Minerals Commission to provide geological information including gold resource potential to all prospective miners.

The procedure for acquisition of a mining licence involves the following steps:

1. Submitting and application with topographical plan of the area being applied for, to the District Officer who coordinates the small-scale mining activities in the district.
2. The District Officer conducts a field inspection to verify the map. The application form is then forwarded to the District Chief Executive for publication and approval.
3. The approved application form and the site plan are then forwarded to the Minerals Commission for approval

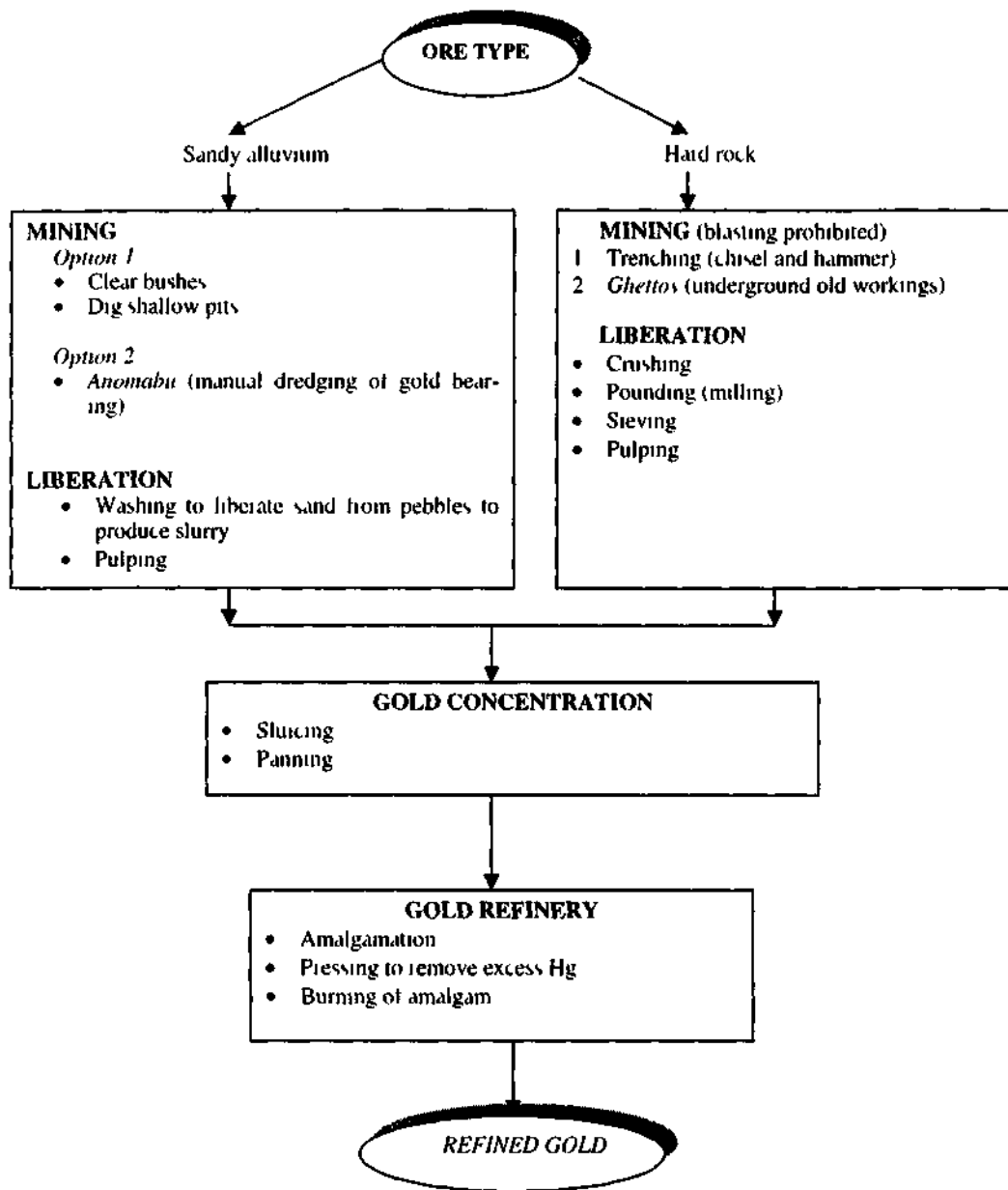


Figure I Flowchart of small-scale gold operation

If approved the applicant takes the signed agreement to the Chief Inspector of Mines to obtain an Operating (Mining) Licence.

3 SMALL-SCALE GOLD MINING AND PROCESSING

Figure 1 summarises the mining and processing stages for both alluvial and lode type deposits.

The mining method used at a small-scale mining operation depends the type of the deposit, either an alluvial or lode type. Small-scale gold mining relies primarily on deposits containing free gold and may be classified as shallow alluvial, deep alluvial or lode type.

- *Shallow alluvial deposits* - locally referred to as *dig and wash* ore found in valleys and streams at depths not more than two metres.
- *Deep alluvial deposits* are found along major riverbanks and older river courses and usually at depths exceeding than six metres. They are usually along the banks of rivers such as the Anko-bra, in the Tarkwa, Asankrangwa and Biabiani districts and rivers Tano and Offin in Asankrangwa and Dunkwa districts, respectively.
- *Lode deposits* are usually composed of partially weathered gold bearing reefs, which either outcrop or are too close to the surface. These deposits are commonly found around dis-used shafts and adits (Figure 2).



Figure 2 A dis-used ventilation shaft

3.1 Mining of alluvial deposits

Mining of shallow alluvial deposits involves digging the material and transporting it to for sluicing at a nearby place. With deep alluvial deposits, large pits are dug to the gravel horizon: workings are maintained in the dry seasons since the pits are flooded during the rainy seasons. The sides of the pits are usually terraced to maintain stability.

The gold bearing gravels are removed and sluiced using water from nearby streams. Gold particles are trapped on the sluiced carpets (Figure 3). After about an hour of washing, the carpets are removed and washed to obtain gold concentrate, which is then amalgamated. The excess mercury is squeezed out and the sponge gold is put in open fire to burn off the mercury.



Figure 3 Sluicing gold concentrate

3.2 Mining of lode deposits

These deposits are commonly found around dis-used shafts and adits. Pits are sunk across the reefs and the lode is further followed along strike. The pits are sunk from the surface at about 8m intervals along strike. Where reefs are weathered the miners use chisel and hammer to break the rock. Where the ore is hard, holes are bored and blasted with explosives although explosive use is illegal.

The lode type ore is crushed manually or mechanically. Where manual crushing is used to liberate the gold (lode type):

- Five-pound hammer is used.
- Fine crushing entails the use of steel mortar and pestle in 2-3 cycles after sieving to -0.5mm undersize
- Fine milling of +0.5 mm is done with corn mill
- Ore-waste materials are sorted on sluice boxes prior to pulping.

Manual method of ore liberation has given way to mechanical means using portable hammer mill (wet milling) before the ore is pulped and sluiced. In general gold recovery rate is normally less than 70%. The recovered gold is sold to the Precious Minerals Marketing Corporation (PMMC); the company Miramex is also authorised by the State to purchase, export and market gold produced by small-scale miners. Gold exceeding 50kg may be exported directly by small-scale miners through PMMC.

4 HEALTH AND ENVIRONMENTAL ISSUES

The Ghanaian small-scale gold mining continues to provide employment for the locals and at national level is a Ghanaian foreign exchange earner. However the operation is associated with sensitive health and environmental issues. Some of these are summarised below:

4.1 Gas emissions and health hazards

1. Illegal blasting produces fumes of noxious gases into the mining atmosphere although its concentration is insignificant in most cases.
2. Some miners rely on old shafts and adits and the trapped noxious gases such as H₂S are released into the mine atmosphere.
3. Exhaust gases from stationary machines, such as hammer mills, modified corn mills and pumps pollute the immediate atmosphere.
4. Mercury fumes are emitted into mine atmosphere during the heating of amalgam in the open.
5. Nitrous fumes from nitric acid during gold refining process.

4.2 Noise

Noise is usually generated from mills used for hard rock crushing. Some residents close to mine sites complain about the noise. Some of the miners suffer hearing loss, although few use ear protectors.

4.3 Impact on water

1. Water pollution occurs during the ore processing. Some operators locate their sluice boxes in the stream. Silting and stream coloration of the river are very common.
2. Drainage of lubricants and oil products from stationary machines present problems such as de-oxygenation of the water posing a threat to aquatic life.

4.4 Land usage

Old gravel pits are usually abandoned without re-forestation. Pits filled with stagnant water are common scenes (Figure 4). Farmlands are usually destroyed through the mining activities. Small-scale mining operations destroy forests, food and cash crops for the local farmers without compensation.

4.i Dust pollution

Crushers are not enclosed and dust particles settle on plants affecting plant growth and human health.



Figure 4 Abandoned pits with stagnant water

4.6 Forest degradation

Where mining is carried out closer to trees, the roots are exposed and hardly support the trees, which eventually fall with the slightest wind or erosion from rain.

4.7 Social problems

Small-scale mining technology is simple and as such attracts many unskilled people for survival. The desire for economic and social survival have attracted many people to the industry. Loss of fertile land and adequate drinking water due to small-scale mining activities put socio-economic pressure on the community.

5 COOPERATIVE VENTURE

There are various means of increasing the recovery of gold ore mined by small-scale operators during the processing phase. One possibility is by establishing a gold processing cooperative owned and operated by the small-scale miners. The local research groups can provide technical expertise to such a venture. The major activities of the group are:

1. Purchasing gold concentrate from small-scale miners and refining the gold
2. Renting gold refinery facilities to small-scale gold miners.

Since the cooperative venture is centralised it will reduce effects of chemical pollutants, such as mercury, on the environment. Figure 5 summarises the potential activities of such a venture.

6 CONCLUDING REMARK

Small-scale gold mining operation in Ghana has serious negative environmental impacts. The Implementation Committee of PNDCL218 must take steps:

- To make detailed geological information available to potential small-scale gold operators
- To initiate some form of taxation system on gold sales to fund land reclamation
- To initiate educational campaigns on good mining practices
- To institute a cooperative venture operated by the local small-scale miners similar to a model adopted by international smelters of metals

REFERENCE

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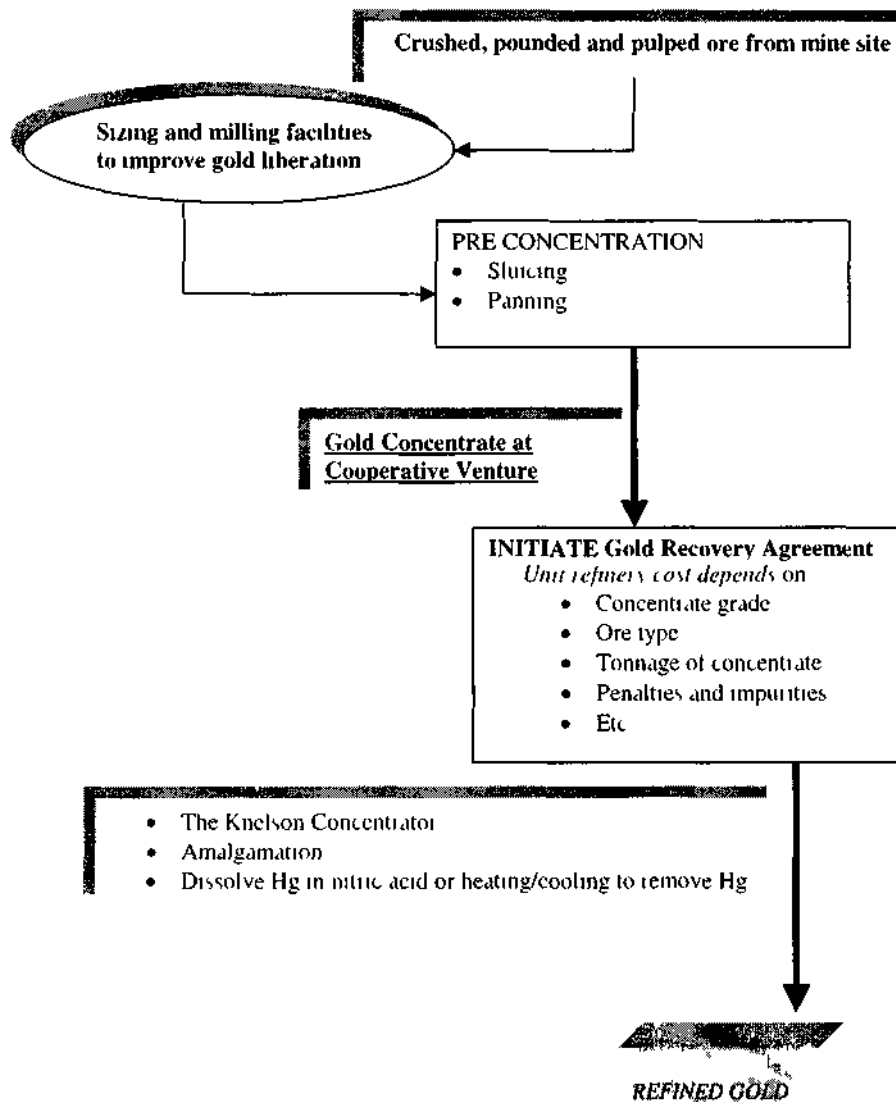


Figure 5 Activities of Small Scale Gold Mining Cooperative Venture

