ENVIRONMENTAL PROBLEMS ASSOCIATED WITH SMALL SCALE MINING IN AFRICA: GHANA'S PERSPECTIVE

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Abstract

The review seeks to present an overview of the environmental problems or impact associated with small scale mining in Africa, taking Ghana as the case study and to recommend ways for alleviating problems. The environmental problems of small scale mining in Africa include land degradation, river and channel erosion, noise pollution, air and mercury pollution. African governments could roll out effective regulatory policies, support education and enhance corruption-free environmental protection initiatives to manage the impacts of small scale mining activities in Africa. In Ghana, the effects of small scale mining activities on land, water, soil and air quality cannot be overlooked. Small Scale mining is characterized by higher and quicker income earnings which makes the activity attractive to most people, especially in the rural communities. The environmental problems of small scale mining in Ghana could be managed if all key stakeholders including regulatory authorities, chiefs and environmental

agencies effectively play their roles and promote community participation in environmental decision-making.

Keywords: environmental, policies, pollution, Small scale mining, regulate

Összefoglalás

Munkánk áttekintést kíván nyújtani Ghána példáján keresztül az afrikai kisüzemi bányászattal kapcsolatos környezeti következményekről és hatásokról, továbbá javaslatokat kívánunk megfogalmazni a problémák enyhítésére. A kisüzemi bányászat által okozott legjelentősebb környezeti káros hatások Afrikában a talajromlás, a folyók és csatornák eróziója, a zajszennyezés, valamint a levegő és higanyszennyezés. A környezeti károk enyhítésére az érintett afrikai kormányok feladata a hatékony szabályozási politika kidolgozása, az oktatás fejlesztése és támogatása, valamint a korrupciótól mentes ügyintézés biztosítása kiemelve a környezetvédelmi kezdeményezéseket. Ghánában nem lehet figyelmen kívül hagyni a kisüzemi bányászati tevékenységek szárazföldi, víz-, talaj- és levegőminőségre gyakorolt hatását. A kisüzemi bányászatot a relatíve magas és gyors jövedelemtermelő képesség jellemzi, amely vonzóvá teszi a tevékenységet a legtöbb ember számára, különösen a vidéki közösségekben. A ghánai kisüzemi bányászat környezeti problémáit akkor lehetne kezelni, ha minden kulcsfontosságú érdekelt fél, beleértve a szabályozó hatóságokat, a vezetőket és a környezetvédelmi ügynökségeket, hatékonyan ellátná szerepét és elősegítené a közösség részvételét a környezeti döntéshozatalban.

Kulcsszavak: környezetvédelem, politika, szennyezés, kisüzemi bányászat, szabályozás

Introduction

The contribution of minerals to Africa's economic growth and development is undisputable. Ghana, formerly called the Gold coast, is the second largest gold producer in Africa, contributing about 40% of the country's gross foreign exchange earnings (Amankwah and Anim-Sackey, 2003). Aside these importance, the exploitation or mining of these minerals in Africa widely consists of small scale mining activities which present serious environmental problems or impact. This review seeks to explain the environmental problems or impact of small scale mining in Africa, taking Ghana as a case study and discussing possible ways of mitigating environmental problems of small scale mining.

Minerals and Small scale mining countries in Africa

Small scale mining has become a fast growing sector in rural sub-Saharan Africa. Burkina Faso, Ghana, Mali, Sierra Leone and Tanzania are among countries with higher number of people dependent on the sector. In Tanzania, there are more than one million small scale mining operators (Bryceson and Geenen, 2016). The operations of small-scale gold has increased since 1984. Today, between 5,000 and 10,000 individuals can be found at a single site (Tráore, 1997). It is estimated that heavy mining activities contributes to the clearing of 100,000 hectares of land each year in Zimbabwe (Maponga and Anderson, 1995).While gold is the focus of most of these operators, other commodities mainly gemstones and diamonds also engage a significant number of people in countries like the DRC, Madagascar and Sierra Leone (Hentschel et al., 2002). Figure 1 below illustrates minerals of small scale mining regions and list of African countries.

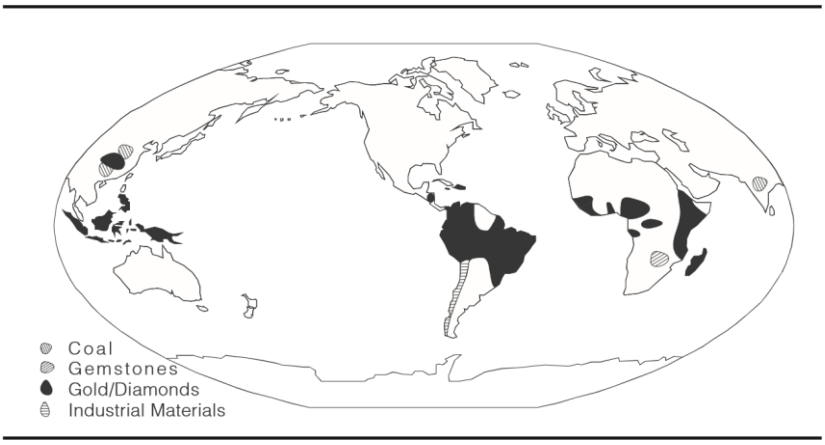

Figure 1. Minerals of small scale mining regions
Africa: Ghana, Kenya, Tanzania, Zambia, Zimbabwe, Ethiopia, Guinea, Liberia, Nigeria, Gabon, Central African Republic, Burundi and Madagascar
(updated from Dorner et al., 2012.)

Environmental impact in Africa

Environmental awareness is mostly low throughout the industry and has few effective environmental safeguards in situ. Few miners regrade excavated land, which is usually left exposed to erosion agents (wind, rain, groundwater, etc.). The fundamental environmental impacts of intensive small-scale mining activity include sedimentation, river and channel erosion, dust and noise pollution. However, the foremost pressing environmental problems in African small-scale mining regions are pollution from mercury and land degradation (Lacerda, 1997).

Mercury which is employed for amalgamation in gold mining, is often dispensed untreated into the atmosphere and waterways where it is then transformed by microbes into toxic methylmercury. Above the recommended level, methylmercury threatens the health of virtually every invertebrate, human, bird and mammal (Wolfe et al., 1998). It is now a widespread contaminant throughout the continent because it is used carelessly. For example, in Victoria Fields, Tanzania, where the yearly input of mercury to gold mining operations is approximately 6 tons, an estimated 24 loads of gaseous mercury has been released into the atmosphere since

1991 (Lacerda, 1997). In another study which was conducted within the Victorian Goldfields, during which samples of water, soil, river sediments and mine tailings were analyzed for mercury content, it had been discovered that mercury had heavily bio accumulated in the natural environment. The findings suggest that the careless handling of mercury could after all, adversely affect the health of many Tanzanian miners (Ikingura et al.,1997).

Small-scale mining, as a migratory industry, has caused substantial land degradation throughout the continent. Thousands of pits and trenches are dug within the process of excavating for prospective ore bodies, many which have since been filled with water and now function as breeding grounds for malaria-infected mosquitoes (Aryee et al., 2003). Furthermore, as a result of intense prospecting and excavation activity, the pristine African rainforest has been removed, vegetation trampled and large areas of earth upturned (Kevin, 2017).

The case study of Small scale mining in Ghana

The activity of individuals engaging in illegal small scale mining in Ghana is locally known as "*galamsey*". The number of people who engaged in illegal mining expanded from 30,000 in 1995 to about one million in 2006 (Bawa, 2006). Some of these people are farmers who cultivate cocoa and other cash crops but eventually abandon their activities to join illegal small scale mining in their quest to get quick money (Figure 2). Morever, Boateng et al. (2014) reported that as a result of quicker and better earning in mining activities contrast to earnings from livestock rearing and crop farming explains the reason for low labor turn out for agricultural activities.

Although the government has long regulated small scale mining, requiring prospective applicants to follow a series of streamlined regulations to get a concession, ineffective policies and bureaucratic inefficiency have impeded formalization, making the illegal activity more

appealing. Factors that have been raised as a propulsion turning thousands of Ghanaians to *galamsey* communities in search of labor include increased rate of unemployment (Hilson and Potter 2005). Another aspect of the debate relates to miners being trapped in a very vicious cycle of poverty and so being unable to readily abandon their activities. It is unfortunate that what has further reinforced this perception in Ghana is the poor response of miners to efforts being made by the government and private sector partners to develop alternative income earning activities in rural areas (Hilson and Banchirigah, 2008). The waste emissions from small-scale mining resulting from the method of extraction and processing causes serious environmental problems that affect the health and livelihoods of residents of most mining communities (Agyemang, 2010). Small scale mining activities also violate the human rights of residents of mining communities and sometimes adjoining communities (Niber, 2008).

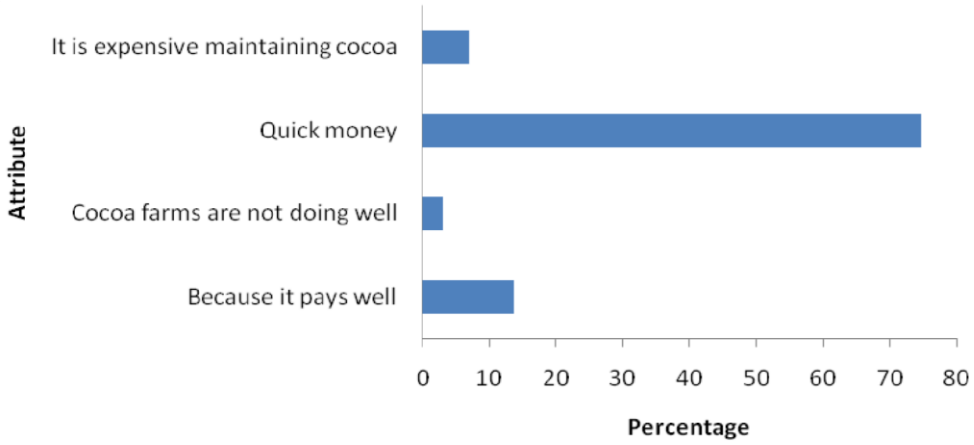

Figure 2. Views on why farmers go into "Galamsey" (Boateng et al., 2014)

Effects of small scale mining in Ghana

Effect of small scale mining on Land

Land degradation is one of the major impacts of small scale mining in Ghana. Flora and fauna are destroyed in the process of mining (Coomson, 2004). The mining of deep deposits typically produces wider openings than shallow deposits. The openings are often not backfilled after the ore extraction. The resultant repercussions are massive gullies, excessive runoff, heavy erosion,

loss of land productivity, reduced soil infiltration, reduction in groundwater recharge and consequent loss of viability for agricultural purposes. These openings also leads to loss of habitat for birds and other animals, and have the tendency of trapping or killing farmers and animals (Akabzaa and Darimani 2001). Examples of trenches and pits created as a result of small scale mining activities are shown in Figure 3. Figure 4 illustrates a degraded land devoid of vegetation cover resulting from gold mining activities in Prestea, Ghana.

Figure 3. Illegal small-scale mining activities (popularly known as "galamsey". Source: Internet)

Figure 4. Degraded land devoid of vegetation cover resulting from gold mining activities in Prestea. Source: Fieldwork, June (2014)

Effects of small scale mining on water

Small scale mining of alluvial gold is a major contributing factor of river water pollution in Ghana. Because of the dredging activities and therefore the washing of alluvial gold in the water, siltation is common in major rivers and streams where the miners operate. The operations have also changed some water course of streams and rivers (Oblokuteye, 2010), depriving downstream users of their only source of water. Fish and other aquatic organisms die-off can occur, altering the food cycle significantly (Aryee et al., 2003). The Bonsa River, for example, which was relied on by farmers and some community members for their source of drinking water and fish has been stricken by illegal small scale mining. Figure 5 shows a section of the

Bonsa River where the mining activities occur. Piles of excavated materials are heaped along the river bank with trees felled into the river.

Figure 5. Highly impure Bonsa River as a result of small scale mining in Ghana

Effects on air quality, poor ventilation and noise pollution

Air pollution resulting from mining related activities comes from the production of dust and emission of mine gases during drilling, blasting, grinding and crushing of ore. The ambient air quality is deteriorated by fine particulates released from the sieving of crushed stones during small scale mining activities (Al-Hassan and Amoako 2014). In terms of underground mining operations, the confined nature of the operation compels dust to be generated within the stopes and accumulate, serving as a possible health threat to the miners. Most of those same stopes are used as openings for entry and exit without any ventilation system in place. This is as result of ignorance on the part of the operators (Aryee et al., 2003). Small scale mining activities can generate loud noise that can result in hearing impairment of the miners and nuisance to the residents of the encircling communities. The loud noise produced by crushing machines during blasting can affect the hearing of the operators who often operate the machines without any form of hearing protection. People who live near the operations see small scale mining activities as major source of nuisance.

Mercury Pollution and impact on Ecosystem

The use of mercury for processing of ore has serious adverse effects on human life and the ecosystem, unfortunately not much attention has been given to mercury contamination in Ghana (Donkor et al., 2006). For example, a research was supported by the United Nations Industrial Development Organization to determine the environmental impacts of mercury on river water, soil and fish samples obtained from Dumasi, (a small scale mining village with about 2000 people) in the Western Region of Ghana. The results showed significant contamination of soil sediments. Most of the fish fillets were also found to have accumulated mercury levels that exceed the United States Food and Drug Agency (US-FDA) action level. The fish from the rivers were reported to be unfit for consumption (Essah, 2000).

Impact on Soil Quality and Agricultural activities

Soils are adversely affected by surface mining. Since miners employ heavy machinery during mineral's extraction, vital soil organisms are destroyed, stable soil aggregates break apart, eventually depriving the soil of organic matter. The soils or newly created substrates are often inhospitable to vegetation due to a combination of physical, chemical and microbiological factors resulting in low yield of crops grown on these soils and subsequent reduction of income generated (Mensah, 2015). Soil substrates from mined areas have very low levels of macro-nutrients especially nitrogen, phosphorus and potassium which can tend to limit tree growth (Sheoran et al., 2010).

Agriculture is an important source of livelihood in mining communities. Crop farming, livestock rearing and fishing are affected by small scale mining activities. For instance, the clearing of shea trees by miners during gold extraction affect shea nut production since such trees are cut down. The bioaccumulation from polluted water as a result of mining activities

makes the aquatic environment not conducive for fishes, thereby reducing their population (Ontoyin and Agyeman, 2014). This occurrence reduces the quantity of fish obtained by fish farmers and the stock of fish obtained can easily go bad within a short period of time. Small scale mining activities has also led to death of livestock, theft of animals and low farm labour productivity (Obiri, 2012).

Mitigating the impact of small scale mining

The government should make conscious efforts to tackle the weakness in environmental policies on small scale mining and strengthen their enforcement in order to achieve sustainability of the environment. In the absence of a workable environmental regulatory framework, sustainability cannot be achieved since the policies will provide the avenue for guiding the overall environmental behavior (Hilson, 2000).

Environmental policies and their enforcement are actions taken to manage human activities with the view of preventing, reducing, or mitigating harmful effects on nature and natural resources. Land reclamation is an adaptive tool to manage degradation and openings created as a result of small mining activities. Regulatory bodies could conduct regular inspection to see to it that, openings and shallow deposits are backfilled after mining activities. The addition of local manure to the soil after backfilled would help to rejuvenate and enhance land formation.

In case of the effect on water, the activities of small scale miners should be guided and properly regulated. Miners should be banned from washing their mineral ore in a whole flowing water body. Miners also should clean or get rid of their unwanted excavated materials to prevent them from getting into nearby rivers and water course. Those that are found culpable should be punished by law to serve as a deterrent to others.

Regulatory authorities should help to make sure that, miners embrace innovative ways of carrying out mining related activities in a manner that drastically reduces loud noise and pollution of fresh air. Miners should also be educated on the dangers associated with the use of mercury and its toxicity to both aquatic and human lives. The government in collaboration with environmental regulatory bodies could organize training workshops for miners on improved techniques, introduce mercury abatement technologies and to help raise overall environmental awareness (Hinton et al., 2003). Regulatory authorities could also resort to the use of local radio stations to disseminate information to miners since the medium has been proven to be one of the effective ways of reaching out to miners (Heemskerk and Olivieira, 2004).

Mitigating the impacts of small scale mining on Soil and Agricultural activities

Soil conservation is important for the cultivation or growing of food that feeds the people. The responsible regulatory bodies should enforce laws that would desist miners from using illegal machinery that excessively distort the soil living and organic components. Miners should be educated on the importance of giving excavated portions of the soil time to heal or recover from previous excavations. Continuous mineral excavation should be discouraged. Regular monitoring by regulatory bodies would help to ensure that, miners stick to places where they have been given consignments, so as to refrain from the forceful clearing of farm trees and food crops of farmers (Aryee et al., 2003; Banchirigah, 2006). Miners should also be admonished by regulatory authorities to avoid undertaking activities that kill livestock and excessively pollute water bodies. Provision of some relief packages, government's commitment and support would help to increase farm labor and enable farmers to thrive in their activities instead of abandoning their farms to go into mining activities (Boateng et al., 2014).

There is a need to organize environmental awareness campaigns and education in various small scale mining communities as a medium of ensuring sustainable use of the environment. Effective community participation in environmental decision making is necessary for natural resources management practices. Participation should not be based on only public consultations but also by creating avenues for open exchange of ideas, transparency, mutual learning, informed and representative decision making (Bastidas, 2004).

Conclusion

Small scale mining is causing huge environmental problems in Africa, for which irrespective of the benefits the industry presents, leaders must first prioritize environmental conservation. Small-scale mining operations in Africa have caused considerable environmental problems such as chronic soil degradation, water and air pollution. African governments, when deciding what approach to adopt to tackle pressing environmental problems in small-scale mining regions, can draw heavily from deep environmental impact assessment in the mining sectors of the countries. For marked improvements to occur, initiatives must be corruption free and also protect the interests of people living around these mining areas. It is suggested that primary emphasis be placed on improved regulation, expanded support and education on the environmental impact of illegal small scale mining activities.

In Ghana, poor monitoring of small scale mining operations, lack of policy implementation and regulatory enforcement by regulatory authorities have led to series of environmental pollution and threats including noise and mercury pollution as well as the effect on the land, water, and air quality. The underground mining operations is characterized by unsafe acts and practices, improper choice of tools, absence of personal protective equipment for drilling and blasting. To deal with the environmental problems associated with small scale mining in Ghana, regulatory

authorities such as the Minerals Commission has to improve its monitoring activities, enforce regulatory requirements and organize workshops to educate miners on the environmental and health risks. Other key stakeholders such as the Environmental Protection Agency, the security agencies, chiefs, landowners, the local and national government must play their roles to mitigate the negative impacts of the sector in Ghana.

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