



International Master's Programme in Environmental Science-
LUMES

Proliferation of Surface Mining in Ghana: A Threat or a Blessing
to the Poor in the Mining areas? A Case Study of Tarkwa Mining
Area

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Dedication

This piece of work is dedicated to my better half **Patricia Ababio Antwi** and the fruit of our union **Richmond Osei Antwi** and to my lovely sister **Joyce Asare**.

I LOVE you in the special way that I have written about in these pages.

To these people I quote;

“The whole theory of the universe is directed unerringly to one single individual –namely you”.

Walt Whitman

Food for Thought

You take my house when you do take the prop

That doth sustain my house;

You take my life

When you do take the means whereby I live.

Shakespeare, Merchant of Venice

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Abstract

Following the implementation of the economic reform policies in 1983 by the government of Ghana, the mining sector in Ghana, especially, gold has witnessed a significant investment boom. Gold production for export has for the past two decades increased tremendously with its attendant revenue for the government. A significant manifestation of this outcome is the increasing number of large-scale mining companies in Ghana recently and much exploratory work going on currently.

More often than not, one of the main objectives of the government for granting mining concessions to those mining companies was to generate employment and revenue to improve the living standards of the people in the mining areas specifically, and that of Ghanaians as a whole. Whether the mining communities have benefited or not from the increased surface mining activities following the reforms, was the main objective of the study.

The study was conducted on the main assumption that economic profitability may conflict with social and environmental sustainability.

Taking Tarkwa mining area as a case study and with data from different sources on economic opportunities, social security and environmental damage, a cursory impact analysis was performed to give a general picture of the consequences of the increased surface mining activities in Ghana.

The study concluded that mineral policy reforms in Ghana have contributed to an enormous increase in mining investment but there has not been a corresponding review of environmental policies to take account of the damage caused to the environment and to sources of livelihood. Similarly, the increase in mining investment has resulted in a significant increase in gold production and the generation of external earnings. However, the wealth generated does not benefit either the national economy or communities located near the mines. The consequences have been a deepened crisis of health and environmental sustainability, social upheavals and economic deprivation.

Key Words: Surface mining; Economic opportunities; Social and environmental sustainability; Sources of livelihood.

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1.0: Introduction

1.1 The Country

Ghana is a resourceful country in the western part of Africa sharing borders with Togo in the east, Burkina Faso in the north, Cote D`Voire in the west, and the Gulf of Guinea in the south. Map 1. It has a population of 18.8 million, according to the last population census taken in the year 2000 and a land area of 238,537 sq/km¹. The country had independence in 1957 and had since undergone a lot of political, social, and economic transformations.

Figure 1: Map of Ghana



1.2 Background of the Study and Problem Definition

The historical importance of mining in the economic development of Ghana is considerable and well documented, with the country's colonial name - Gold Coast - reflecting the importance of the mining sector in the development of the country. Gold dominates the mining sector and Ghana is Africa's second most important producer of gold after South Africa, the third largest producer of manganese and aluminium and a significant producer of bauxite and diamonds (Coakly, 1998). In addition, inventories of iron, limestone, kaolin, salt and other industrial mineral resources exist but are not exploited on a large scale.

From the inception of Ghana's economic policy changes in 1983² to date, the mining sector has witnessed a considerable investment boom and increased production, particularly in the gold sector (Tsikata, 1997). There has been considerable growth in the number of new mines and exploration companies. Before the implementation of Ghana's economic policy in 1983, there were only five large-scale mining companies but an annual report published in December 2000 revealed that there are currently 19 large-scale mining companies and over 128 local and foreign companies with exploration licenses, mainly in the domain of gold (Mining bulletin, 2000). The

¹ National population census is officially taken every four years.

² Ghana implemented a drastic but comprehensive economic policy which aimed to transform all the non-performing sectors especially the cocoa and the mining sectors.

sector has increased its contribution to gross foreign exchange earnings and appears to have attracted substantial foreign direct investment funds over the years. By the end of 1999, the sector had attracted over US\$3 billion worth of foreign direct investment. The sector now accounts for more than 30% of gross foreign exchange earnings. In 1999, officially reported output of newly mined gold was 54.4 metric tons with a market value of about \$545 million (Annual Budget Statement, 2002; Ghana Chamber of mines, 2000).

The most predominant mining operation in Ghana is surface mining taking about 75% of the mining activities in the country (Tsikata, 1997). Surface mining requires the acquisition of large tracts of land, the average of which is about 58 square miles (150 square kilometers), with a 30-year lease period. Despite the boom in the gold sector, the local communities have not benefited, but have caused environmental and social problems that can have impact on future economic growth and poverty reduction. However, there is lack of coherent, comprehensive and coordinated local level impact assessment of mining on the people living in these areas.

This study aims to contribute in this area and analyzes the problem in terms of economic policies- design and implementation. Currently, the growing incidence of conflict between mining communities and their chiefs on one hand and mining companies on the other hand echoes the growing disquiet about the effects of the mining sector- led structural adjustment programme on the population.

A very simple but analytical question that could be put forward is; Is this growing activities of surface mining a threat or a blessing to the people living in those areas where these activities are going on? In other words, has mining in Ghana improved the livelihood of the people in the mining areas (the purpose of which mining concessions were granted to the mining companies) or has it worsened their plight economically, socially, and environmentally?

1.3 Objective Of Study

The main objective of this work is to assess the socio-economic and environmental effects of the mining sector reforms implemented under the structural adjustment programme, with particular reference to the affected mining communities in the Tarkwa mining area. The specific aims are reflected in the terms of reference for this project, which include:

- An impact analysis of mining operations/investments, focusing mainly on the people living in and around gold mining areas in Ghana. Special emphasis will be laid on the

three dimensional aspects of poverty by using the capability approach i.e. i. Opportunities ii. Security iii. Empowerment.

- Evaluation of adequacy of mechanisms for decision-making, negotiation and conflict resolution between various parties in the sector; the role of state agencies and issues of good governance.
- Investigate whether there are effective and sustainable mine closure plans in the negotiation process and whether they are implemented to the benefit of the poor.

1.4 Statement of Hypothesis

Together with the objectives of the study and the specific goals above, it could be hypothesized that;

- Economic sustainability (profitability) may conflict with social and environmental sustainability
- Institutional factors play an important role in integrating social and environmental concerns in economic policy making.

1.5 Scope and Limitation of the Study

The scope of the paper will be limited to an impact analysis of gold mining with special emphasis on surface mining. Both large-scale and small-scale mining are highlighted for the purpose of understanding their contribution to the economic development of the country (Ghana). However, the impacts of small-scale mining will not be covered by this thesis. Emphasis will be laid on how understanding the social and environmental aspects and dynamics of large-scale surface mining on the people in the mining communities will contribute to the physical national negotiations and planning process, hence adopting and implementing policies aimed at making surface mining more sustainable. The main idea is the integration of economic opportunities, security, and empowerment of the affected people in the mining areas into the planning and implementation process.

Participatory groups include in this study include indigenous farmers, local miners, immigrant miners, and rural-urban migrants.

Farmers: These are small-scale farmers who depend on subsistence agriculture for survival in the study area. These are potential culprits of surface mining due to huge lands required for its operations.

Local miners: These are natives of Tarkwa and its immediate surroundings who have been employed by the mining companies in the Tarkwa District.

Immigrant miners: These include those who are not natives of Tarkwa but have moved to the Tarkwa area and are currently working with any of the mining companies in the Tarkwa area.

Rural-urban migrants: These are people who were living in the rural parts of Tarkwa but have moved to the Tarkwa township to look for job.

The main limitation is the unavailability of adequate data on social and environmental damage on those mining communities as a result of surface mining operations in the past. Also some of the unit of analysis such as rivers and streams, social disintegrations, psychological well-being, etc are very difficult to measure in real monetary terms.

1.6 Conceptual Framework

The basis of this study was built on the notion that a well-developed and improved gold mining sector has the potential to become a major export commodity with its attendant foreign exchange earnings for Ghana. It explains that with the current investment incentives offered by the Government of Ghana (GOG) to mining companies³, more surface mining activities would be carried out since it is the least expensive⁴ compared to underground mining. Conceptually, the more these mining activities are carried out, the more gold would be extracted for export hence more income to the mining companies and the government. It stipulates that a strong mining sector will lead to the provision and improvement of social infrastructures such as roads, hospitals, good drinking water, schools, etc. However, continuous surface mining will not only lead to the depletion of gold reserves but also to some negative social and environmental consequences on the people living in these mining areas as illustrated by the causal loop diagram (CLD) below.

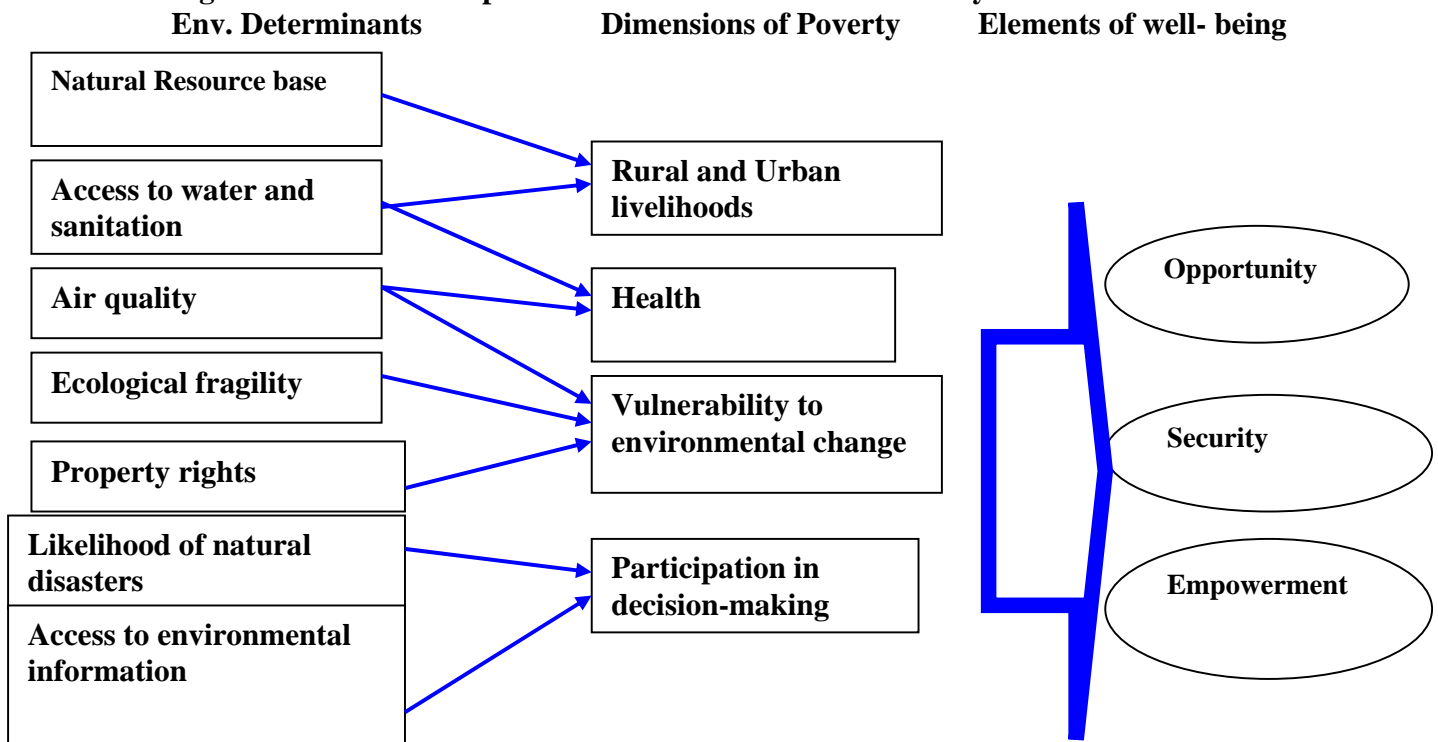
³ The Minerals and Mining Law (PNDCL 153 and its subsequent amendments) provided a wide range of concessions to mining investors. Mining companies were allowed/permitted to retain between 25% and 80% of their export value offshore. Source: Thomas Akabzaa, 2000. Boom and Dislocation. Environmental Impacts of Mining in the Wassu West District of Ghana. Published by Third World Network, June.

⁴ About 80% of mining operations in Ghana are surface mining.

attendant diseases. High prevalence of diseases reduces economic productivity of the people and reduces their income, which subsequently increases poverty. Further, mining has the potential of degrading large tracks of land and this leads to loss or reduction of farmlands. Lost of farmlands means economic loss to the farmers and this subsequently increases poverty.

1.8 From Concepts to Reality

Figure 3: Schematic Representation of Dimensions of Poverty



Adopted and modified from Julia Bucknall, et al. (2000)

The mechanisms involved in poverty are complex so this thesis uses the capability approach in discussing well-being of the people affected by mining projects in the country. From the CLD (figure 2) above, mining has the potential of increasing the wealth of the people through job creations and development projects by mining companies. At the same time, mining has the potential of hampering the well-being of the affected communities by taking away the source of their livelihoods (in this case farmlands), environmental pollution through discharges of effluents into water bodies which the communities depend on as well as social disorganizations through resettlements and relocations.

Figure 3 above is a schematic representation of well-being through the capability approach and it summarizes the main issues relating poverty and mining as illustrated in the CLD (figure 2)

above. The diagram again is used as the baseline of analyzing the findings from the study area and should also serve as a guideline for planning and implementation of mining projects in the country.

2.0: Literature Review/Theoretical Framework

2.1 Mining Defined

Mining encompasses the extraction of metals and minerals from the ground (Weber-Fahr and Andrews, 2002; Downing, 2002; Cernea, 2000). My definition of mining in this thesis does not include oil or gas extraction. It is the extraction of non-renewable resources from the ground (Pouling & Sinding, 1992).

Mining operations include open-pit (surface mining) and underground mining, and large-scale operations as well as activities of small-scale and artisanal miners

2.2 Mining and Sustainable Development

“Sustainable Development” has now come to the fore front of the development agenda both for mining as demonstrated by the Mining, Minerals and Sustainable Development (MMSD) Project and for overall economic development as reflected by the Johannesburg summit on Sustainable Development that took place in August 2002 and the World Bank’s World Development Report (WDR) 2003: *Sustainable Development in a Dynamic Economy*. The 2003 WDR warns that environmental problems and social unrest threaten international poverty reduction goals and suggests that new alliances are needed at the local, national and global levels to better address these problems.

Talking about sustainable development and why it has become a must for the mining industry in the 21st Century, as part of the coverage for the Johannesburg Summit, the World Bank web site specified that “*Sustainable Development means ensuring that actions today to promote development and reduce poverty do not result in environmental degradation or social exclusion tomorrow*”. The implication of the above statement from a layman’s perspective is that any economic policy aimed at improving the lots of the people must take into consideration environmental and social security of future generations. For the purpose of this study I would propose that sustainable mining development involves projects that are

- Financially viable
- Environmentally sound
- Socially responsible

- Implemented with sound governance (not only companies but also communities and governments)
- Have lasting value at the community level.

Together, these characteristics should result in financially viable mining development that takes place in an environmentally and socially responsible manner with sound governance and provides lasting economic and development benefits to the local community i.e. benefits that continue long after a specific mine has closed.

Talking about whether sustainable ideas should be a matter of concern, many research findings and development reports have come to the conclusion that any development project that discards the ideas of sustainability must be rejected entirely by governments and communities which those projects affects at the feasibility stage (Downing, 1999; WDR 2003). Sustainable mining matters because we have reached a point in history where communities are demanding - and rightfully so in my view - that the benefits of commercial development outweigh the negative impacts. This involves moving from a narrow definition of “environmental sustainability” to a broader definition which embraces “sustainable communities”, that is communities which are able to turn part of the wealth generated by mining into assets which help ensure that the community has a sustainable future after the mine closes. This broader sustainability is absolutely essential in order for a mining project – or any other project for that matter – to contribute to poverty reduction and economic development at the local and regional level. The importance of creating sustainable outcomes was highlighted by two World Bank researchers, Peter van der Veen and Monika Weber-Fahr, in an article entitled: ***“Sustainable Development – Not A Tough Choice but A Must for the Mining Industry”***. (Monika Weber.Fahr, et al, 2002).

The “traditional” mining development model has all too often been that the benefits accrued predominantly to the investor (in terms of profits) and the national economy (in terms of taxes and foreign exchange) whereas the costs (environmental damage and social disruption) occurred primarily at the local level. The “sustainable development” model is that mining development should take place in an environmentally and socially responsible manner so that the costs to the community are minimized, while benefits are shared with affected communities so that they can build a sustainable future beyond the life of the mine (Barry 1996).

But is a sustainable development approach affordable in practice? Many investors are concerned that the actions required to ensure lasting benefits from mining projects will raise costs and make their projects non-competitive compared with projects that follow the mining development model. There is now a growing body of evidence that this is not the case and that the “sustainable development” approach, when well implemented, can provide net benefits not only to the community but also to the investor (McMahon and Remy, 2001; ICMM Newsletter, 2002).

2.3 Mining and Opportunities

Mining operation, whether small or large scale has the potential of improving the national income of the country as well as improving the lots of the people living in the mining areas. However, there are other economic risks as well to the poor in the mining areas. The opportunities, as well as the risks, begin at the exploration stage and continue through mine construction, operation, closure or cessation of mining activity, as well as during post-closure years.

2.3.1 Positive impacts on opportunities

On the national level, fiscal income generated through taxes collected from mining operations for some countries forms a substantial part of the government’s revenue base. This can be used for means-tested or otherwise targeted policy interventions for poverty reduction. According to a report from the World Bank on “mining and development”, Tax receipts from a single mining company can amount to 30% to 50% of a country’s fiscal income. Examples include Debswana in Botswana and HALCO in Guinea (IIED, 2002; Remy and McMahon, 2002).

In Ghana revenue generated by the government in the form of taxes from the mining sector alone in the 1999, 2000, and 2001 fiscal years were between 35% and 45% of the country’s fiscal income (Budget Statement, 2002; Goldfields, 2001; Statistical report, 2002). However, this potential may not always be used as efficiently as possible, in particular, in the context of governance and corruption issues and where state ownership of the mining operation is involved. Studies have shown that the contributions of privately owned mining companies to national development is much encouraging than state-owned mining operations (Bromley, 1991; Anderson, 1991).

On the regional and local level, any large-scale mining operation has the potential to significantly and positively affects economic opportunities for the poor. In the region where the mining operation is located, it can provide:

- substantial additional employment opportunities—with higher income generation potential than most, if not all, other employment in the area; and
- investments in basic public infrastructure, goods, and services with universal access, for example, transport, water, and power (Turner, 1998; Pearce and Turner, 1990)- this creates opportunities for the local people.

Aside from a mining operation's direct employment impact, there is substantial potential for developing downstream and lateral economic activity with suppliers and refiners, particularly for small- and medium-sized enterprises, in turn generating employment opportunities for non-miners surrounding area. Typically, employment generated indirectly by a mining operation amounts to a range of between 2 to 25 times the number of direct employees, in certain cases even more than that (Barry, 1996). Typical examples are Yanacocha in Peru, and Ok Tedi in Papua New Guinea. Studies have shown that every dollar spent by a mine on operations could generate an average of 2.8 dollars in the local economy, in terms of induced economic activities (World Bank, www.worldbank.org/poverty).

The contribution of mining to private sector investment is well documented. A successful mining operation can be a catalytic for further inflow of private-sector investment in a country or region if it takes place within a supportive policy context characterized by reliable regulatory frameworks. After an economic or political crisis, the natural resource sector is often the first sector to attract foreign investor's attention due to its potential for foreign-currency-denominated export earnings and close links to local energy sectors investment strategies. Ghana is a typical example after the national economic crisis in 1983. Mining for coal, for instance, has helped countries with significant coal resources such as China, India, and South Africa to access cheap energy, thereby fueling these countries' economic growth and creating further opportunities for those not involved in the mining sector (World Bank, 2001).

2.3.2 Negative impact on opportunities

The poor are at some risk of not participating in the economic opportunities of mining while bearing many of the costs as well as risks that result from the introduction of a mine in an undeveloped area. A large-scale mining operation requires major capital investment in infrastructure, technology, services, and employment. The ability of the poor to participate in this investment is limited by their education and work skills (Mensah, 1998). Even worse, their

income sustaining opportunities and livelihood might be reduced due to the presence of a mine. This can happen in several ways:

- (a) the mine might use natural resources such as land and water on which in particular the poor may depend by limiting opportunities to generate incomes from agriculture, fishing, or hunting;
- (b) the mining operation might use regional infrastructure services to the extent that the poor will entirely lose access, either due to the services' increased prices or due to simple capacity limits. Spiropolous, 1989, reported that an unanticipated effect of the construction of a new mine on an island in Papua New Guinea was overwhelming demand for ferry and other boat services which effectively excluded the poor from using them and drove up the cost of goods because of rapid increases in ferry and boat prices.
- (c) higher incomes of mine workers can lead to rising local prices for key goods (food, fuel, land/housing) and services—with others in the area not only left behind, but with significantly shrunk real incomes.

At the same time, environmental damage incurred during a mining operation, or left behind after mine closure, ranging from water pollution or restrained water quantity to tailings and subsidence, can seriously limit people's current and future income opportunities, in particular when dependent on agriculture, fishery, forestry or hunting.

Corruption and macro-economic mismanagement can severely limit the positive impact of mining creating opportunities on the national level. Countries such as Congo and Zambia have shown little overall development benefit from the copper production of the past decades, with state-ownership and mismanagement characterizing the sector. At the same time, other sectors in the economy might be impeded in their development in a situation in which large mining investments lead to a positive shock (boom) with consequent Dutch Disease⁵ effects on the non-mining economy, endangering the promotion of other sectors. Production in these other sectors (e.g. agriculture) would contract, with resulting downward shifts in employment and wage levels. Those who are least able to move to the growing, mining-related sectors would be hit hardest.

⁵ The Dutch Disease hypothesis is that a positive shock (boom) to an important primary product causes an appreciation of the real exchange rate. This results in a movement of resources to the non-tradable sector and the boom sector, and away from tradable manufacturing and agricultural products. The exchange rate shifts can cause problems in promoting competitive diversification into non-commodity sectors (McMahon, 1997).

2.4 Mining and Security

Large-scale mining can contribute, through higher incomes, to better nutrition and better education, and thus to improved health profiles in a community. However, a mining operation can also expose the local population, and in particular the poor, to serious risks to their health and well-being, as well as to the stability of their employment, income, and spending power (McMahon, 2001). These risks are discussed below, as they would be key areas of consideration for governments when drawing up regulatory frameworks and social or environmental standards for mining investments.

2.4.1 Health risks

Individual health risks associated with large-scale mining evolve around work-related injuries and health risks, as well as around an increased exposure to infectious diseases and environmental issues. The number of injuries and fatalities in mining varies a lot between countries, mostly depending on mining methods and technologies used, and whether minerals are mined in open-pits or underground. The level of other work-related health risks, e.g. respiratory diseases, depends on what mineral resource is mined (coal vs. metals).

Further to individual health issues, group related health risks and social problems could impact on entire mining communities. In Southern Africa many miners are migrant workers, sometimes on the companies' demands, sometimes by choice, living without their families and within disrupted social contexts. Along with higher incomes, and a lack of information and education about prevention, this situation can contribute to a high prevalence of human immunodeficiency virus (HIV) and other communicable diseases among miners. Indeed, several mines in Southern Africa report infection rates of about 50% among their workforce, well above national averages. Indirect negative health impacts from mining tend to affect women in particular - due to their responsibilities, within the extended families, of caring for children and the sick, elderly, or disabled (www.worldbank.org/mining/poverty/).

2.4.2 Environmental damage

Damages to the Environment during a mining operation can lead to further health risks that may be caused by a variety of effects, ranging from water pollution or restrained water quantity to dust, noise, and subsidence. For instance, a cross-study analysis of environmental damages as a

result of mining operation in 51 mining countries across the globe put about 60% of the residents in these communities at risk (Weber-Fahr, 2002). In the context of mine closure, abandoned or orphaned mines often are serious causes of concern, continuing to cause ongoing pollution and potential public danger. Environmental and health standards may not have been agreed upon at the beginning of a mining operation, or they may not be easily monitored. Auty (1993), Anderson (1997), have reported separately that, lack of preparation for mine closure at the time of a mining operation almost certainly increases negative impacts on local environments and regional economies upon closure, in turn affecting government budgets (cost of “clean-up”) and societal stability.

2.4.3 Risks to the stability of employment, income, and spending power

The positive economic development that often follows the establishment of a mining operation can also have negative effects on consumption levels of the poor. Higher incomes of mine workers, especially in relatively isolated areas, can lead to rising local prices for key products (food, fuel, transport)—with the poor left behind. Mining can use significant amounts of land and water, which can impact the poor who depend on these resources for their livelihood and food security. For example in Irian Jaya (Indonesia) the indigenous Amungme people eventually filed a lawsuit against the mining company for environmental damages, compensation for native lands and human rights violations (Sundaram, et al, 1998). In Western Australian, for many years the aboriginal people did not share as well as other groups in the benefits from the iron ore mining industries, nor did they feel they had been adequately involved in decisions affecting their traditional lands, culture and heritage (Duffy, 1994).

In the context of mine closure, the sudden end of economic opportunities, when not planned for, tends to increase local poverty levels dramatically. In Namibia, in the late 1990s, foreign mining investors closed their operations and withdrew without notice leaving the Government and the local communities to deal with the mine closure without any preparedness. Sudden mine closure can also deprive the local population of the most basic social services and of access to public goods, such as clean water, energy, or transport, if the mining company previously had provided these. In Ghana, the sudden closure of Dunkwa Goldfields mines in the late 1980s deprived all the communities in the area from electricity supply since this had been previously provided by the mining company (Songsore, et al.1994). Lack of these services and goods affect vulnerable groups more drastically than others. The often-remote location of mining operations increases the challenges for local economic development in the aftermath of mine closure, with government resources typically hard to free up for these areas. The problematic social and environmental

legacies left behind by mining operations, then, can compromise the economic benefits they once yielded (Anderson, 1997).

2.4.6 Risks to socio-cultural stability

One of the significant impacts of large-scale mining on the local community is a rapid change in the economic and social fabric of society. The findings are that (Biney 1998; Downing, 2002) disparities in incomes emerge and the lure of new opportunities creates in-migration.

Different groups compete for access to public goods and social services and new tensions in the community abound: New types of poverty are created (Downing 2002), with a mixture of “original residents” who have been unable to share in employment opportunities, and “newcomers” who have migrated in with the hope of finding employment, but have been unsuccessful in doing so. Social ills such as alcohol abuse, prostitution and child labor often increase.

2.5 Mining and Empowerment

2.5.1 Participatory rights of local communities

Local communities often find themselves disempowered during decision-making processes regarding mining operations that concern the land and resources they live of or are otherwise connected with. They are left without appropriate access to information and denied – implicitly or explicitly – participation in these decision making processes. In most countries, local communities hear about the acquisition of a mining license only after the fact, and subsequently often find themselves dependent on the good-will of individual mining company officials, trying to understand the meaning of key documents, often prepared in technical language and far exceeding any layman’s ability to digest details. Mining companies do not always have the skills, or the necessary persistence, to organize and sustain inclusive, well-managed and trust-inspiring consultation processes. While most governments by now require some form of consultation with local communities, there is typically little guidance in terms of quality and level of the processes or the staffing of key liaison personnel (Bird, 1994; Downing, 2002).

Such situations are exacerbated in the case of actual accidents or conflicts as tensions and fear on both sides lead to a de-facto break-down of communication, with national or international arbitration institutions unavailable. Even within an ideal regulatory framework, compliance with consultation and disclosure regulations requires regular monitoring. Yet, governments – who could play a key role in ensuring compliance – are often at risk themselves, as the abundance of

financial flows from mining, real or imagined, contributes to increases in national, regional and local corruption (Cernea, 2000). This, in turn, leads to a decreasing access for the poor to public decision-making processes. McMahon had earlier on made such assertions (McMahon, 1998)

Sustained efforts toward public consultation and disclosure of information at the onset of mining activities, during its operation as well as in anticipation of mine closure, have been shown to effectively facilitate interactions between a mining company and the communities affected by its operation (McMahon and Remy, 2001). Occupational health and safety and related issues are typically at the center of a long established practice for mining companies to consult with trade unions, over and above typically regular wage negotiations. Careful design of consultation processes is particularly critical if the mining operation involves issues that impact on the poor's ability to participate in choice and implementation of public actions with regard to managing risks and opportunities from the mining operation (Sen, 2000; Word bank 2001). Some of these issues include:

- Re-location and in-migration, with consequent changes in demography and settlement patterns, in particular where indigenous people are involved;
- Change and disorder in the existing social structures, hierarchy and leadership, possibly due to a breakdown in the traditional regulatory and authority systems, where elders no longer have the skills and education to represent the changing needs of their constituencies;
- Weaknesses in the formal government systems/structures to deal with the changing social and economic situation, in particular where the sudden increases in fiscal revenues have fostered corruption and other governance malfunctions;
- Conflict and civil strife over the use and distribution of resources in terms of water, land and access to infrastructure;
- Significant differences between international standards and legal and regulatory requirements in the country, in particular with regard to environmental and labor issues (health and safety, trade union/freedom of organization, etc.).
- Changes in the existing value systems from traditional or customary systems of ownership to that of monetary transfers (e.g. land use systems, natural resource utilization (terrestrial and aquatic). See www.ifc.org/cao.

3.0 Case study

3.1 Background to the case study area

The study area is Tarkwa and its environs in the Wassa West District of the Western Region of Ghana. Tarkwa is the administrative capital of the Wassa West District. Tarkwa has nearly a century of gold mining history and has the largest concentration of mines in a single district on the continent of Africa, with virtually all the six new gold mines operating surface mines. Many of the multinational mining companies in the area have gold mining concessions in other West African countries with similar rock units.

These rocks occupy about 60% of Ghana and nearly the entire study area. The area contains a significant proportion of the last vestiges of the country's tropical rain forest, which declined from 8.2 million hectares in 1992 to 750,000 hectares by 1997 (Adadey, 1997). The heavy concentration of mining activities has generated environmental and social issues in the area. The issues centre on resettlement and relocation, negotiation and compensation and environmental damage. The persistence of these socio-environmental problems accounts for the occasional and frequent resistance from the affected communities as well as clashes between them and the mining companies. The destruction of sources of livelihood and the spate of resistance and clashes have given rise to an environmentally conscious population from which local social movements are emerging.

3.2 Methodology and Material

The study was undertaken on one mining community (micro- level) but scaled up with secondary information from the district, regional and national levels to address the micro-and macro- aspects of the assessment. It consisted of desk study and primary data collection. The desk study consisted of a literature review of existing reports and works i.e. previous studies relating to the subject matter, at the community, district, regional and national level in other African countries and elsewhere in the world. The primary data collection involved visits to selected communities in the Wassa West District to assess the social structure of the communities as well as the environmental aspects of surface mining in those communities. The aim was to pave the way for active involvement of the communities. The field visits also included the identification of stakeholders - communities impacted by mining, mining companies, government support agencies for the sector, non-governmental organisations and community-based organisations to solicit their effective participation. The participatory methodology was achieved through focus

group discussions alongside with informal interviews with 60 residents (20 each) from three mining resettlement areas. The study also used non-structured interviews with four heads of institutions which include, Tarkwa District Health Officer, Tarkwa District Lands Officer, the Health and Safety Officer for Ghana Australian Goldfields (GAG), and the National Director of the Environmental Protection Agency. These were purposively selected to collect certain vital information in their fields necessary for this study. Three chiefs and two opinion leaders were also interviewed to ascertain the communities' involvement in decision making with regards to mining activities.

3.3 Results from the case study

This section of the chapter presents the findings of the study from the study area. With the aid of tables, the section presents the economic and social contribution of gold mining to the people in those areas and to the nation as a whole. It also presents the findings on environmental and social disturbances associated with surface mining in the mining areas.

3.4 Economic Contribution

In other to understand the prominence of gold mining as an economic activity in the area, the number of mining companies operating in the area was sought for. Table1 below illustrates the details.

Table 1: Large scale mining companies in the study area (Tarkwa)

Company	Location	Commencement Date	Mining Method
TGL	Teberebie (Tarkwa)	1990	Open cast (OP)
GFL	Tarkwa	1993	Underground (UG)/Open cast (OP)
BGL	Tarkwa	1990	Open cast (OP)
GAG	Iduapriem (Tarkwa)	1992	Open cast/heap leach
Barnex Ltd.	Prestea	1997	UG/OP
Sankofa Gold Ltd	Prestea	1995	Tailings
Abosso Goldfields Ltd	Abosso	1997	OP

SGL	Tarkwa	1999	OP
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Source: Boom and Dislocation

It is realized from table 1 that between 1989 and 2000 eight Multi-National mining companies were given concessions to operate in the Wasswa West District⁶. Also eight out of the ten large-scale mining companies operating the country are found in the district alone. Also only two (25%) out of the eight companies operate underground mining. The remaining six (75%) operate surface mining.

Mineral production by the various mining companies operating in the Tarkwa region alone was also sought for to aid the analysis of this project. Details are presented below on table 2.

Table 2: Mineral Production in the Tarkwa Region (1991-1996). NB: Gold is in ounces

Company	1991	1992	1993	1994	1995	1996
Goldfields (Gh) Ltd	27,595	26,550	39,265	39,394	44,442	46,256
Teberebie Goldfields	79,111	128,594	164,885	177,290	235,471	239,285
GAG	-	37,893	123,302	128,602	134,279	141,109
Abosso Goldfields	-	-	-	-	-	-
Barnex Ltd	22,773	22,878	24,024	24,673	25,033	25,784
Sankofa	-	-	-	-	5255	6400
Billinton Bogoso	61678	78076	94536	109050	107677	111225
GMC (in tonnes)	311824	276019	295296	138420	179359	182358
Small-scale mining	463.6	-	503.88	791.27	805.99	537.34

Source: Minerals commission

Gold production as indicated above for all companies in the area increased every year. The reason behind this increment in productivity, the study find out that it was both increase in utilization of concession area and improvement in production technology.

To be able to analyse the mining sector's contribution to foreign exchange earnings to the country, data on foreign exchange earnings for gold alone was collected. Table 3 presents the gross foreign earnings from 1986 to 2002.

⁶ The Wasswa West District capital is Tarkwa. In all Ghana have 110 districts.

Table 3: Contribution of Gold to Foreign Exchange Earnings.

Year	Contribution to foreign exchange earnings (%)	Value in U.S.\$ (Million)
1986	15.6	124.4
1990	27.0	243.3
1995	45.5	682.2
1998	46.0	793.0
2002	45.0	680.0

Source: Ghana Export Promotion Council, 2003.

From table 3 above, the sector appears to be very important as far as foreign exchange earnings in the country is concerned. From 1986 to 2002, the sector has been contributing between 45% and 46% to total foreign exchange earnings in the country.

The contribution of gold alone in relation with the other major minerals produced in the country is also important for the analysis. Table 4 presents data on the output of gold in relation with three other major minerals produce in the country.

Table 4: Gold production in relation to other major minerals from 1991-2000

Commodity	Unit	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Gold	%	83.2	86.38	88.37	91.64	93.27	95.44	95.40	95.00	93.72	96.70
Diamond	%	6.81	5.45	4.97	3.09	3.47	2.02	2.05	2.00	3.54	1.98
Manganese	%	5.86	5.73	4.22	2.98	1.63	1.00	1.10	1.00	1.00	1.05
Bauxite	%	4.13	2.44	2.44	2.29	1.63	1.54	1.30	2.00	1.74	0.27

Source: Minerals Commission & Ghana's Annual Budget Statements

From table 4 above, it could be realized that, the percentage contribution of other minerals (compared to that of gold) in the country is less significant. Gold alone ranges between 83 and 97 % for the 10year period indicated above. Diamond according to the data above is the second leading producer with Bauxite being the last currently.

To analyse the argument that the sector is major contributor to government revenue, data to that effect was sought for. Table 5 gives the details.

Table 5: Contribution of the mining sector to Government Revenue in (billion) cedis⁷

⁷ Cedi is the legal tender (currency) for Ghana. Exchange rate to the US Dollar is ¢ 8000= \$1, September, 2003

Year	Income Tax (¢)	Mineral Royalties (¢)	Total Revenue (mining) (¢)	Total Revenue (IRS) (¢)	% from Mining
1991	2,825,941,158	1,893,436,000	4,719,377,158	52,818,088,300	8.94
1992	821,844,978	3,021,277,000	3,843,121,979	61,485,625,496	6.25
1993	4,555,051,883	4,545,804,000	9,100,855,883	74,731,531,366	12.18
1994	4,310,958,293	7,485,121,000	11,796,079,293	113,236,997,000	10.42
1995	6,942,264,873	12,783,689,000	19,725,953,873	166,595,941,000	11.84
1996	19,713,191,185	20,911,926,000	40,625,117,185	275,513,201,000	14.75

Source: Adadey 1997: The role of the mining industry in the economy of Ghana.

Total revenue from mining (i.e. income tax + royalties) alone rose from 4.7 billion Cedis in 1991 to 40.6 billion Cedis in 1996. The percentage contribution of mining to the overall revenue mobilized in the country by Internal Revenue Service (IRS) ranged between 6.25 and 14.75 for 6 year period indicated above.

To know the contribution of the sector to the generation of employment in the area, the employment statistics of the major mining companies in the area for 1995, 1996, and 2000 were collected. Table 6 gives the details.

Table 6: Employment Statistics of Major Mining Companies in the Tarkwa Area

Company	1995	1996	2000
TGL	941	1194	1413
GAG	536	586	680
BBG	1058	1025	-
GGL	1459	-	1138
Barnex	1580	-	1496
Sankofa	143	227	-
AGL	-	-	309

SGL	-	-	523
GMC	732	920	693
TOTAL	6449	3952	6252

Source: Minerals Commission

The sector employed 6449 in 1995 but reduced to 3952 in 1996. The reasons for this reduction are given in the next chapter. There was, however, an improvement in the year 2000 with the sector employing 6252 employees but this number is still less than that of 1995.

To aid the analysis of the sector's contribution to the economy of Ghana, data on the sector's contribution to gross domestic product (GDP) from 1990 to 2000 was collected. Table 7 presents the details.

Table 7: Percentage Contribution of Mining to GDP

Year	% Contribution
1990	1.3
1991	1.3
1992	1.4
1993	1.5
1994	1.5
1995	1.5
1996	1.5
1997	1.4
1998	1.5
1999	1.5
2000	1.6

Source: ISSER, Legon (2000)

The sector's percentage contribution to gross domestic product (GDP) from 1990-2000, according to the data available, ranged between 1.3 and 1.6.

3.5 Social Impacts

The displacement records of the affected communities as a result of surface mining were also analyzed. Table 8 presents the details.

Table 8: Number of people displaced in the area by mining between 1996 and 1998

	No. of Communities	No. of Communities	Total Population
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Company	Resettled	Relocated	Displaced
TGL	3	1	522
GAG	0	1	45
GFG	6	7	20,000
AGF	1	1	3,700

Source: Ghana Social Foundation, 1999

3.5.1 Family disorganization

The resettled communities were visited to ascertain the housing standards in those areas.

Table 9: Housing standards in the resettled communities

Community	Standard rooms provided	Providers
Atuabo	3 bedrooms	TGL
Teberebie	2 bedroom	GAG
New Damang	3 bedrooms	AGF.
Mandekrom	3 bedrooms	GFG

Source: Field Survey (August, 2003)

3.5.2 High cost of living

The cost of some basic items such as food and water, etc, necessary for everyday living in the area were compared with that of some major cities in Ghana. Table 10 below presents the details

Table 10: Cost of Living in Tarkwa area compared with 3 other Cities in Ghana

Indices	Town	Price in Cedis (¢)
1 bag of rice (50kg) (Between July & Sept. 2003)	Accra	220,000
	Kumasi	210,000
	Tarkwa	285,000

	Sunyani	225,000
1 bedroom & a living room (standard) (Between January & October 2003)	Accra	40,000*
	Kumasi	30,000*
	Tarkwa	60-70,000*
	Sunyani	25,000*
1 bucket of drinking water (30 litres) (Between July & Sept. 2003)	Accra	200
	Kumasi	150
	Tarkwa	350
	Sunyani	100

Source: Field Survey, 2003

NB: * Rent is paid monthly and the prices are more or less stable than that of foodstuffs and other basic items.

3.6 Environmental impacts

For the environment, three parameters (land use, water quality and availability, and air quality) were used for this study and data were collected on those parameters to aid the analysis.

3.6.1 Land use

To ascertain how mining has impacted on land use in the affected communities, data on what the land in the study area is currently used for was collected. Table 11 gives the details.

Table 11: Land use in Tarkwa District

Total land area	% Covered by surface mining	% Covered by agricultural farmers	Others (%)
9235 km ²	65	25	10

Source: Land Surveying Department of the Wassai West District Assembly

From table 11 above, the total land area is 9235km² and out of this 6002.75 km² (i.e. 65%) is currently covered by surface mining while agriculture covers 25% only.

3.6.2 Drinking water quality

Data on water samples from some communities in the study area analysed by the Environmental Chemistry Division of the Water Research Institute of the Council for Scientific and Industrial Research (CSIR) is presented on table12 below.

Table 12: Water samples from Tarkwa mining area

<i>Parameter</i>	<i>Guide Value for Maximum Permissible Concentration in Drinking Water</i>			<i>Sampling Stations</i>		
	EU	WHO	USA	Nkwantakro (Stream)	Mile 7 (Well)	Teberebie (Borehole)
PH	6.5-8.5	6.5-8.5	6.5-8.5	6.46	6.38	5.37
Colour (Hu)**	20	15	15	700	5.0	5.0
Suspended Solids* * (Ss)	4	5	1-5	138	12.0	14.0
Zinc (Zn)	0.1	3.0	5.0	0.05	0.03	0.08
Lead (Pb)	0.05	0.01	0.05	0.04	0.01	0.01
Cadmium (Cd)	0.005	0.005	0.005	0.01	0.01	0.02
Manganese (Mn)**	0.02	0.5	0.05	8.89	0.05	0.08
Iron (Fe)	0.05	0.3	0.3	0.4	0.2	0.01
Chloride (Cl)	25	250	-	7.4	17.4	8.0
Sulphate (SO ⁴)	25	250	250	34.1	6.5	0.1
Chromium (Cr)	0.005	0.05	0.05	0.08	0.07	0.13
Nikel (Ni)	0.05	0.02	-	0.04	0.04	0.07
Cobalt (Co)	-	-	-	0.11	0.14	0.11
Silica (Sio ²)	-	-	-	10.1	35.1	26.5
Faecal Coliform** (counts/100m)	0	0-3	1	146	108	28

Source: CSIR, 2000. NB: Results are in mg/l except pH and where otherwise stated.

** These parameters will be used mostly in the analysis.

3.6.3 Water Availability

Water availability survey for some selected communities is presented under table 13 below.

Table 13: Water Availability in the affected communities

Community	Source of water	No. of Residents	Provider	Status
Mile 7	One hand-dug well without pump and One hand-dug well with pump	750	GAG	Not productive Low water yield

Mile 8	One hand-dug well with pump and one Well without pump	1020	GAG	Very low yield Out of production
Yaw Manu	Hand-dug well without pump	465	GAG	Well water is direct seepage from nearby polluted stream
Kumsono	3 Boreholes	2052	BGL	One is currently out of production
Bekoase	-3 Boreholes -1 Dam	3000	GFL	OK Dried-up

Source: Field Survey, 2003

3.6.4 Air Quality

Data on air quality in the study area was sought for to aid the analysis of how continuous blasting affects the environment and human health. Table 14 presents the details.

Table 14: Air Quality in the Tarkwa area

Date	PM10: gm ⁻³	SO ₂ : gm ⁻³	Smoke: gm ⁻³
16-11-99	77.3	26	80
21-11-99	15.6	26	14
26-11-99	38.9	26	18
03-12-99	37.4	40	18
12-12-99	48.1	33	22
24-12-99	36.4	33	69
31-12-99	52.9	40	134
07-01-2000	19.9	32	155
14-01-2000	68	32	207
17-01-2000	57	26	171
24-01-2000	54.4	32	110
28-01-2000	48.5	19	118

Source: Report from EPA's Mines Monitoring Team, 2000

3.7 Health Impacts

Following the data on table 14 on the quality of air in the area, data on annual reported cases on respiratory diseases was collected to ascertain how constant blasting on rocks for gold affects the health of the residents. Table 15 presents the details.

Table 15: Annual Reported Cases of Respiratory Diseases at Tarkwa Government Hospital, 1996-2002

Year	Upper Respiratory Tract Infection	Pneumonia	Tuberculosis (TB)	Total
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1996	356	101	83	540
1997	594	78	76	748
1998	1227	35	72	1334
1999	692	27	73	792
2000	881	93	111	1085
2001	1244	145	146	1535
2002	1420	724	151	2295

Source: Tarkwa Government Hospital

4.0: Discussions

4.1 Introduction

It was extremely difficult to perform a thorough cost–benefit analysis of mining in view of time constraints and the weak culture of information disclosure in the country in general and in the mining sector in particular. What this chapter seeks to do is to discuss the perceived benefits of mining investment on local communities, as ascertained through the study and to see why some of these perceptions do not conform to reality on the ground. Thus, these cursory impact analysis of mining sector investment on local communities have been done looking at economic and social effects, as well as environmental and health impacts. The analysis compares the level of foreign direct investment inflows to the sector since the reforms to the level of employment, net foreign exchange earned, and the negative social and cultural impact of mining investment in the area.

4.2 The Mining Industry in the Study Area

Tarkwa, as stated earlier, has the highest concentration of mining companies in the country and the West African sub-region and possibly the Africa. It was also realized that, out of the 16 large-scale mines in Ghana eight of them are located in the Tarkwa area, producing a significant proportion of the country’s gold output (Table 1 above). The only manganese mine in the country is also located in this area. In addition, the visit to the area gathered that there are over 100 registered, small-scale gold and diamond mining companies in the area together with more than 600 unregistered miners popularly known as galamsey operators. There are also about 30 local and foreign companies exploring for gold and diamonds in the area.

4.3 Economic Impact

4.3.1 Direct Foreign Investment Inflows

The mining sector has been the leading recipient of foreign direct investment capital. Between 1986 and 1997, the sector attracted about US\$3 billion of foreign direct investment, representing

more than 60% of all such investment in the country (Akabzaa, 2000). Most of these funds went into mine rehabilitation and expansion of existing mines, new exploration projects, development of new mines and establishment of mining support companies such as equipment supply companies, assay laboratories etc. The most publicized benefits of the increased mining sector investments resulting from Ghana's economic reforms include the following: i) Mining is the leading earner of foreign exchange in the country. ii) Provides substantial government revenue iii) Provides capital and social infrastructure to the public. iv) Generates direct and indirect employment. v) Develops communities in mining areas

4.3.2 Foreign Exchange Generation

Increased investment in the mining sector as a response to economic reforms has resulted in monumental increase in output in all major minerals, with gold enjoying the most phenomenal growth (Table 4 above). Total value of minerals produced has equally been ballooning. The sector has become the leading gross foreign exchange earner since 1992.

Again, the sector's contribution to the nation's gross foreign exchange earnings also grew progressively from 15.60% in 1986 to 27% in 1990, 45.5% in 1995 and to 46% in 1998. In absolute terms, the sector generated US\$ 124.4 million in 1986, US\$242.3 million in 1990, US\$682.2 million in 1995 and US\$793 million in 1998 as been presented in table 3 (page 25). Gold export earnings increased from 14.5% of total exports in 1986 to 43.3%, in 1995 but decreased to 37.6% in 1998 due to depressed gold prices.

While in gross terms, mining is the leading foreign exchange earner, its net foreign exchange contribution to the national economy has been minimal. With regards to the sectors contribution to GDP, it has not been encouraging, as it has been stagnating at 1.5% since 1993. Generous incentives and tax breaks given to investors and the fact that mining companies retain on the average about 70% of their export earnings in off-shore accounts for various purposes helps explain the sector's minimal contribution to net foreign exchange receipts.

4.3.3 Generation of Government Revenue

For the generation of revenue, the study realized that the industry generates revenue for the internal economy through the following sources:

- I) Salaries, wages and other payments made to employees and contractors.
- II) Corporate income taxes, royalties, concession rents, services, customs and harbour duties.

- III) Taxes on salaries of employees, and social security contributions from employees and their employers.
- IV) Dividends to shareholders.
- V) Equipment and consumables purchased locally.
- VI) Import duty and purchase tax on vehicles.
- VII) Electricity and water charges.
- VIII) Divestiture of state mining companies and sale of government shares. The sector has been contributing quite substantial amount to internal revenue mobilization in the country especially on corporate income taxes, royalties and concession rents. Mining sector's contribution to revenue mobilized by the Internal Revenue Service (IRS) increased from 8.94% in 1990 to 14.75% in 1995 (see table 5). The bulk of mining sector revenue emanates from royalties and income taxes of local employees. However most of the companies in the country and the study area in particular do not pay corporate income taxes due to the virtual tax holiday enjoyed by these companies as a result of the generous capital allowances that they enjoy.

4.4 Generation of Employment

The mining sector is said to be a significant contributor to formal and informal employment in the country. Up to 1995, the sector accounted for an estimated 20% of formal sector employment, with large-scale mining companies employing about 20,000 people, and the small- scale and artisanal mining sectors accounted for more than twice that number. In addition, mining sector support companies such as assay laboratories, equipment leasing and sales agencies, security and catering agencies also contribute to formal sector employment. However the reality on the ground has a different picture. The sector has a relatively limited capacity to generate employment. This is because surface mining operations are capital- intensive with relatively low labour requirements. All post-SAP mining ventures have being surface operations. Goldfields (Gh.) Limited was one of just three mines operating labour- intensive underground mines but it closed its underground operations in 1999, sending home about 1,000 workers.

Again, the divestiture of formerly state-owned mines resulted in significant restructuring and cost-cutting by their new owners to ensure efficiency. In addition, the persistent decline in commodity prices especially gold has resulted in radical restructuring to reduce costs. Many mines have reduced their labour force substantially, in the last three years especially.

With regards to the study area, the sector employed 6449 people in 1995 and 6252 in 2000 (table 6). Out of this number, the visit gathered that less than 20% were natives from those mining areas. The reason been lack of formal education and expertise required in the sector.

4.5 Social Impact

4.5.1 Introduction

The social organization of every community is guided and directed by certain principles. The concentration of mining operations in Tarkwa has had an adverse impact on the social organization and cultural values of the people. Though the parameters are many, this section discusses the findings from the study area under the following sub-headings;

- Displacement of people as a result of surface mining
- Family Disorganization (Housing standards in the resettled areas)
- Cost of living in the affected communities

4.5.2 Displacements

Between 1990 and 1998, mining investment in Tarkwa has led to the displacement of a total of 14 communities with a population of over 30,000 (FIAN, 2001). Some people had to migrate in search of farmland while others were relocated or resettled by the mining companies. An Environmental Impact Assessment (EIA) of four mining companies operating in the study area gave the total number of people to be displaced as 22, 267 from 20 communities. Table 8 gives breakdown of the population displaced and the company responsible. The growing displacement of communities and people has resulted in increased migration of the youth—who were not considered for compensation to the towns, especially Tarkwa, in search for jobs.

The sudden flow of people into the township has created a major problem of housing. Rents have raised so much that the migrant unemployed youth cannot afford available rooms in the townships and Tarkwa residents in rented houses have also been affected. Besides those forced to live in severely overcrowded conditions, many of the migrant youth turned the Tarkwa Railway station and lorry parks into places of abode. A majority of those interviewed reported having lived in make-shift structures in the forest or in hired rooms in villages such as Atuabo, Teberebie, Old Damang, Mandekrom, Old Iduapriem, settlements that have been displaced by large-scale mining activities. A situation of this nature also has the potential of generating other social problems such as drug trafficking, prostitution, high school dropout rate, etc, which are all common in the study area.

4.5.3 Family Disorganization

The relocation and compensation measures implemented by various mining companies in the Tarkwa area have had serious consequences for the family as a close-knit social unit. New housing arrangements for resettled communities have also disrupted long established family networks in the area. In many instances, the housing units provided by the mining companies have not conformed to the size of households. For instance, a family that had a house with five rooms and large space was resettled in a house with three rooms in a crowded space (Table 9 in the previous chapter). About 75% of the residents of the resettled communities interviewed complained of inadequate internal space (number of rooms, size of rooms) and open external space for other domestic activities. Also, the compensation scheme has helped disorganize some families. In the Tarkwa area, irresponsible, male family heads (the interview gathered) opted for relocation instead of resettlement. This enabled them to collect cash compensation and they subsequently abandoned their families. This has deepened the plight of affected rural women and children.

4.5.4 High Cost of Living

One of the known, negative effects of mining is the high cost of living within communities near mine locations (Anderson, 1991; Bromley, 1991; Pearce and Turner, 1990; Downing, 2000). All the indices i.e. food, accommodation, health, water, etc that make a decent life in the study area have a price tag beyond the reach of the average person. At the same time, the traditional sources of recreation and livelihood of the people are seriously impaired by mining activities, a situation that sparks off or aggravates other social problems. Two main factors are responsible for the high cost of living in Tarkwa. First, there is the disparity in incomes in favour of mining company staff. For example, the salaries of the Ghanaian staff in the mines are indexed to the US dollar, which raises their income far above their counterparts in the public sector. In addition, the expatriate staff of the mines are paid internationally competitive salaries, which further widens the income disparities in Tarkwa. This group of high- income earners has thus influenced the pricing of goods and services such as housing, food and other amenities.

Secondly, the mining industry has withdrawn a significant percentage of the labour force from agriculture and other income-generating activities by taking farmland away and holding out the false promise of employment. The fall in food production in an area that is already densely populated, with high unemployment, accounts for high food prices. The average price for a plate of food is currently 25,000 Cedis (\$3.00 US) compared to less than \$1.00 income of most of the residents. Between July and September 2003, a bag of rice that was selling 220,000 Cedis in

Accra, was being sold for 285,000 Cedis in Tarkwa while the price was 210,000 Cedis and 225,000 Cedis respectively for Kumasi and Sunyani. These harsh economic conditions have subsequently pushed children of school- going age into menial jobs at the expense of their education. Child labour and high, school dropout rates is notable in communities in the study area. The long-run implication of a situation like this is the continuation of the vicious cycle of poverty as illustrated by the CLD below.

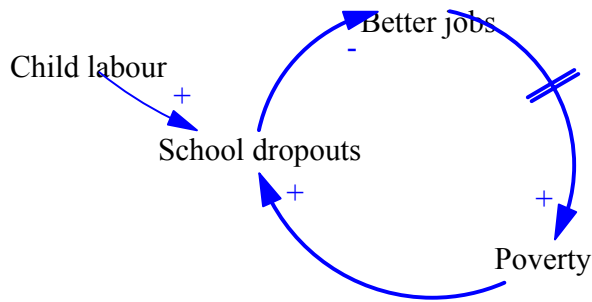


Figure 4: A CLD representation of the cycle of poverty

4.6 Environmental Impacts

4.6.1 Degradation of Land and Vegetation

Considerable areas of land and vegetation in Tarkwa have been cleared to accommodate surface mining activities. Currently, surface mining concessions have taken over 70% of the total land area of Tarkwa. It was realized in a chart with the Tarkwa District Lands Officer that by the close of a mining company, at least 40-60% of its total concession space would be utilized for activities such as sites for mines, heap leach facilities, tailings dump and open pits, mine camps, roads, and resettlement for displaced communities. This has significant adverse impact on the land and vegetation, the main sources of livelihood of the people. There is already a scramble for farmlands in Atuabo and Dumasi.

The tailings dam of one mine has taken a total of 6.3ha of land. Given an estimated per acre yield of cassava of 108,000 bags. This means the tailings dam has denied the farmer a minimum of 275,351 bags of cassava per annum. The tailings dam, plant site and feed stockpile of Ghana Australia Goldfields Ltd. alone has affected a total of about 315 farmers currently cultivating around the area. This has significant implications for the farmers' income and food security of the family.

The deforestation that has resulted from surface mining has long-term effects even when the soil is replaced and trees are planted after mine closure. The new species that might be introduced have the potential to influence the composition of the topsoil and subsequently determine soil fertility and fallow duration for certain crops. In addition to erosion when surface vegetation is destroyed, there is deterioration in the viability of the land for agricultural purposes and loss of habitat for birds and other animals. This has culminated in the destruction of the luxuriant vegetation, biodiversity, cultural sites and water bodies.

4.6.2 Water Pollution

Many mines have an active programme to lower the water table or divert major watercourses away from the mines. This exercise has disruptive consequences for the quality and availability of surface and ground water. The concentration of mining operations in Tarkwa has been a major source of both surface and groundwater pollution. Four main problems of water pollution have been noticed in Tarkwa mining areas. These are chemical pollution of ground water and streams, siltation through increased sediment load, increased faecal matter and dewatering effects. Various chemicals such as cyanide and mercury are used during ore processing. These chemicals constitute the major pollutants of surface and ground water. Chemical pollution could also occur through the misuse, mishandling and poor storage of explosives. Sulphur dioxide fumes from mining companies could also generate extensive chemical pollution. In addition to chemical pollution, heavy metals from mining operations contribute to water pollution. The presence of such heavy metals above a certain threshold can be injurious to human health and the environment, particularly aquatic life. Water samples obtained from boreholes, wells and streams within Tarkwa area produced startling results of very high abnormal content of faecal chloroform, suspended solids, chloride, colour and manganese content, particularly in the Angbenabe River at Nkwantakrom. While the permissible level suspended solids, for instance, for the EU, WHO, and USA ranged between 1 and 5, results of water analyses of the stream at Nkwantakrom had as much as 138 mg/l. For colour, the international standards range between 15 and 20 mg/l, while the same river had as much as 700mg/l. Table 12 in the previous chapter gives the details.

The health implications of this scenario on the people depending on this stream are obvious and this threatens their health security.

4.6.3 Dewatering Effects

Mining has active dewatering effects. Apart from consuming a huge amount of water, extensive excavation of large tracts of land and the piling of large mounds of earth along watercourses remove the source of water recharge for groundwater sources and ultimately reverse the direction

of flow of ground water, causing active dewatering. A number of boreholes, hand-dug wells and streams in the area have either become unproductive or now provide less water. It was observed during the survey that many of the boreholes and hand-dug wells in the area including those provided by some of the mining companies for resettled communities have problems relating to yield. They were either not producing at all or producing very little water. At the resettled community of Teberebie, one of the two boreholes provided by TGL was out of production while the second one gave an extremely low yield. The same dewatering process reduces recharge to streams, especially during the dry season. Mining activities draw a huge amount of water from the Bonsa River, resulting in lower water flow levels in the Bonsa and the lower reaches of the Angonabeng River and lengthening patches of dryness during the dry season. The concentration of mining operations in Tarkwa area has considerable, adverse impact on the accessibility and availability of both ground water and surface water resources.

4.6.4 Air Pollution

Mining activities and mining support companies release particulate matter into the ambient air. The concerns of the affected communities on air quality have been the airborne particulate matter, emissions of black smoke, noise and vibration. Airborne particulates of major concern within the Tarkwa area include respirable dust, sulphur dioxide (SO₂), nitrogen dioxide (NO₂), carbon monoxide (CO) and black smoke. The activities that generate this particulate matter include site clearance and road building, open-pit drilling and blasting, loading and haulage, vehicular movement, ore and waste rock handling as well as heap leaches crushing by companies doing heap leach processing. Others include fumes from the roasting of sulphide ores by assay laboratories and in refining processes. The release of airborne particulate matter into the environment particularly minute dust particles of less than 10 microns poses health threats to the people of the Tarkwa area. All fine dust at a high level of exposure has the potential to cause respiratory diseases and disorders and can worsen the condition of people with asthma and arthritis. Dust arising from gold mining operations has high silica content which has been responsible for silicosis and silico-tuberculosis in the area.

Results of air quality monitoring for dust showed values far above acceptable, detectable limits for health safety. The EU, WHO and EPA levels for the pollutant are 50 gm⁻³, 70 gm⁻³ and 70 gm⁻³ respectively. On the contrary values obtained from the EPA monitoring station at the Tarkwa Government Hospital is as high as 199 gm⁻³. Table 14 shows the results of a 12-day monitoring exercise. The table shows that during the 12-day monitoring exercise, there were five days on which the level of pollutants exceeded the EU-approved limit. It must also be pointed out

that the monitoring station is located about 6km from the nearest surface mining operations. This means that the level of pollutants would be much higher for communities around the fringes of the mines.

The same dust is deposited on the vegetation, making it unpalatable for both human and livestock consumption. The consumption of green leaves popularly called 'kontomire' has fallen significantly among households that have become conscious of the deleterious effects of the dust. This also has adverse consequences for the diet of the people. Measures to reduce dust, according to the health and safety officer of one of the mining companies interviewed, are occasional spraying of roads within the premises of the mining concessions. This appears to be a misplaced effort because road dust does not appear to be the main source of dust pollution. Furthermore, the EPA admitted that dust suppression on the haulage roads is ineffective and the frequency of spraying inadequate, particularly in the case of TGL.

Black smoke from fuel burning, fumes from the assay laboratories and ore roasting at Prestea constitute additional sources of airborne pollutants in the Tarkwa mining district. There were cases where the values recorded for smoke exceeded the tolerable levels of the EU, WHO and EPA. The highest value recorded was 207 gm^{-3} as against the tolerable levels of 100 gm^{-3} for the EU, 85 gm^{-3} for the WHO and 40 gm^{-3} for EPA-Ghana. The other particulate matter of concern in the area is sulphur dioxide (SO_2). This comes from the roasting of sulphide ore by Prestea mine and assay laboratories, vehicular emission and domestic energy sources of fuel such as liquefied petroleum gas (LPG) and kerosene. The high concentration of sulphur dioxide gives rise to acid, which subsequently produces sulphuric acid ($\text{H}_2 \text{SO}_4$). Sulphuric acid can cause breathing difficulties and discomfort. According to Park (1987), at toxicity limits of $0.5\text{--}1\text{g/l}$, there are no visible effects on health, but toxicity greater than 1.5g/l can result in breathing difficulties and from 200g/l and above can cause great discomfort. Some of the harmful effects of sulphuric acid include heart disorders, asthmatitis, bronchitis, lung problems and other respiratory disorders. Indications are that an extensive amount of SO_2 and black smoke is being released into the air. This is a health threat to the people.

4.7 Health Impact

Part of the major adverse environmental impact of mining is the generation of diseases due to pollutants and accidents at mines. The effects of some of these pollutants manifest themselves immediately (cyanide, for example) but others (such as mercury) take a long time to show up. In

Tarkwa, the extraction and processing of gold has given rise to various environmental related diseases and accidents. According to the District Medical Officer of Health Dr. Avorti, the common, mining-related diseases observed in the area over the years include, but are not limited to:

- a) Vector-borne diseases such as malaria, schistomiasis and onchocerciasis.
- b) Respiratory tract diseases, especially pulmonary tuberculosis and silicosis.
- c) Skin diseases.
- d) Eye diseases, especially acute conjunctivitis.
- e) Accidents resulting from galamsey activities, and
- f) Mental cases.

Data obtained from the District Medical Office, Tarkwa, suggest that mining impact related diseases such as malaria, diarrhea, upper respiratory diseases, skin diseases, acute conjunctivitis and accidents form the top ten diseases in the area.

4.7.1 Respiratory Diseases

There is an increasing trend for respiratory diseases in the area. The incidence of upper respiratory tract infections (URTI) is relatively high in the area, with an annual average of 840 reported cases. Pneumonia and pulmonary tuberculosis follow, with annual reported cases of 199 and 109 respectively. Details of this are presented in table 15. The table shows that with the exception of the decline in 1999, reported cases of the three major respiratory diseases have been on the increase from 1996 to 2002. According to the District Medical Officer of Health, TB has a strong history in the area. The rock formation in which gold is found in the Tarkwa area has very high silica content. Therefore, the dust generated by mining activities contains silica, which causes the silicosis, tuberculosis and silico-tuberculosis diseases. The miners and residents who inhale this dust are thus exposed to these diseases. This explains why there is a high level of silico-tuberculosis among miners in the area. A 1989 study of one mine in the area recorded a 1.2/1000 incidence of silico-tuberculosis while the incidence of pure silicosis was 1.9/1000. The average incidence of tuberculosis in the District is 0.5/1000 against the national average of 0.003/1000.

4.8 Institutional Malfunctioning

Procedures for the application of environmental impact assessment (EIA) to development projects and mining have been well developed and documented. Once in operation, the mines are obliged to prepare and submit their environmental action plans, annual environmental reports and

environmental audit reports to the environmental protection agency (EPA). This is to ensure periodic assessment of environmental performance by all existing mines and to issue such directives as may be necessary for the timely intervention by the mines to address any environmental problems that might result from their operations. Act 490 of the 1992 constitution gave rise to the passage of an Executive Instrument 9, 1999 and regulations to support issue specific areas under the Act. One of the regulations is Legislative Instrument 1652, Environmental Assessment Regulations, 1999. The Executive Instrument 9, 1999 made provision for the appointment of certain categories of staff of EPA as public prosecutors in respect of offences committed under Act 490 and the Pesticides Control and Management Act 528, 1996 while the legislative instrument provided standards for granting permits and licenses.

The evolution of these policies was intended to redefine the functions of EPA as a regulatory institution with the legal powers to ensure compliance and enforcement of environmental quality standards. Unfortunately, this has not been practicable for most mining operations for a very long time due to the inadequate institutional capacity of the Agency, the lack of coordination among mining sector institutions and the weaknesses of the EIA process. An interview with the National Director of the Environmental Protection Agency (EPA) in Accra confirmed this. According to the director, the EPA lacks the required capacity in terms of personnel and finance to ensure compliance and enforcement of environmental quality standards. He added that, the operational environment defined by the law is quite extensive, applying to all types of industry including mining and agriculture. Unfortunately, the appropriate staffing levels, especially of professional staff, are woefully inadequate to meet the extensive demand imposed by Act 490. By the close of 1999, the total staff of the Agency was around 200. Between late 1999 and the first half of 2002, the Agency had only one Legal Officer. The Tarkwa District office, the only district in the country to host an EPA office, has only one officer to cover a total of nine mining companies. Inadequate funding compounds the staffing situation of the Agency.

4.9 Conclusions and Recommendations

Due to the diversity of issues involved in the subject of study in this thesis, my conclusions are under two main subdivisions. One deals with the actual results from my research in the study area and the other is based on results from overall understanding on the subject matter.

A) Conclusion from this research

Poverty is complex and multi-dimensional and any therefore policies and strategies aimed at reducing poverty must be comprehensive to incorporate all the different dimensions of poverty in the planning and implementation phases.

Three main elements of well-being which include security, empowerment and opportunities were the baseline for the assessment of impacts of mining operations on the local communities.

The study was conducted on two main hypotheses: The first hypothesis that economic sustainability/profitability may conflict with social and environmental sustainability has been confirmed according to the results obtained through the social and environmental parameters used in the analysis. Again, the hypothesis that institutional factors play an important role in integrating social and environmental concerns in economic policy making is also confirmed.

The thesis, therefore, concludes that mineral policy reforms in Ghana have contributed to an enormous increase in mining investment but there has not been a corresponding review of environmental policies to take account of the damage caused to the environment and to sources of livelihood. Similarly, the increase in mining investment has resulted in a significant increase in gold production and the generation of external earnings. However, the wealth generated does not benefit either the national economy or communities located near the mines. The consequences have been a deepened crisis of health and environmental sustainability, social upheavals and economic deprivation.

B) Conclusion from overall understanding

Policy reforms in Ghana's mining sector have introduced generous incentive packages for mining investors but have failed to provide solutions to community concerns. Difficulties have been encountered in harmonizing mining and environmental laws and policies in order to improve the conditions for local communities.

Also procedures exist for the application of environmental impact assessments (EIA) to all mining projects beyond exploration stage. These procedures are well documented on paper but are confronted with problems of implementation on the ground.

To ensure economic, social and environmental sustainability, my recommendations for improvement are as follows:

4.10 Policy Issues

- The legal and policy framework relating to mining should be overhauled in order to impose stronger environmental and social responsibility and accountability on the mining companies. Incentive packages similar to those provided for by the laws for

the mining companies should be designed for communities affected by mining projects. The state and the relevant mining companies could then work out the modalities of meeting such community incentives.

- ❑ The current mining environmental guidelines are riddled with weaknesses that enable mining companies to destroy with impunity the environment and the livelihood of local people. For instance, the confidentiality clause providing for non-disclosure of Environmental Audit Reports on mines and Annual Audit Reports makes them inaccessible to the public. Ironically, these are meant to be public documents because the audit reports are part of the EIA process that requires the participation of all stakeholders. There is, therefore, the need to review the mining environmental guidelines to make the audits public documents and to ensure environmental compliance and accountability.
- ❑ There should be effective co-ordination among public sector mining support institutions and other stakeholders such as the Traditional Councils, opinion leaders and members of the communities affected by mining. This would promote transparency and ensure harmonious enforcement of policies governing Ghana's extractive sector.

4.11 Environmental Impact Assessment Procedures

- ❑ The confidentiality clause attached to EIA Audits should be removed to facilitate public access to these documents. Environmental audits are considered confidential reports. Deprived of access to the information contained in these reports, the public is, therefore, unable to press their demands for environmental compliance.
- ❑ The procedure should clearly demand the effective participation of communities in the adoption of the study methodologies and in baseline studies. Effective community participation is provided for but not guaranteed in the EIA process because the proponent or their consultant conducts the EIA independently. In this way, the investor establishes the desirable content of the EIA after consultation with selected opinion leaders in the project community. The EIA information system is transformed into a consultation process reaching out to only those with power and authority in the project community. This process is not participatory enough to reveal potential, cross-sectoral impact.

- ❑ Communities affected by mining projects should be represented in the nine-member Technical Review Committee of EIA reports. Currently, the committee does not include representative of the communities. This will promote transparency in the process.
- ❑ Adequate financial support and technical equipment should be provided for mining and environmental regulatory institutions to ensure effective monitoring of mine operations around the country in general, and in Tarkwa in particular. This would also enable the institutions to build the capacity of the local communities to monitor environmental compliance. The concept of self-monitoring by companies is not suitable because companies can manipulate the data to suit their own circumstances.

4.12 Economic and Social Issues

- ❑ There should be an intensive and systematic study of the area to ascertain the cumulative impact of mining. This study would provide the baseline data for effective monitoring and sound environmental management practices. This study is even more necessary in view of the concentration of mine projects and mining investment in the area and its unique ecological position in the country as a whole.
- ❑ A holistic strategic plan for the District that factors in the eventual closure of the mines is required to minimize the long-term effects of the destruction caused to the area by the current concentration of mining investment. Such planning should take into consideration the environmental media such as water, land, vegetation, and shelter that have been seriously impacted but which constitute important elements in the continued viability of human existence.

4.13 Areas for further Research

1. There is the need for a thorough cost-benefit analysis study of the mining sector to ensure that the appropriate policy changes are effected to guarantee sustained and improved mining sector investment in the country. The analysis should take into account the incentive packages to investors, the amount of foreign inflows to the sector, the quantum of investment to the sector and the net returns to the home economy and to host communities. The analysis should also factor in the environmental and health damage as well as the social crises arising from the sector.
2. Studies should also be conducted on the impacts of mining on the mining workers and their families.

3. With regards to land degradation involved in surface mining in Ghana, there must also be similar studies in the small scale or artisanal mining operations to make an informed judgment.

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6.0 APPENDIX- Outline of interviews and discussion

A) INTRODUCTION

I am a final year student of the Lund University International Master's Programme in Environmental Science (LUMES), Sweden. As part of the requirements for the Master of Science (MSc) Degree, I am conducting a research on the "impacts of mining".

You are assured of strict confidentiality and that any information/comments given will be used only for the purpose of my research. You are therefore not required to give your name or anything that will make it possible for you to be identified.

I do hope that you will be able to help.

Thank you.

B) Agenda for interviews and discussions

i) Residents (Background information)

- a. For how long have you been living in this area?
- b. What is your present job/occupation?
- c. Have you changed your job recently? If Yes, what was your previous occupation?

ii) Mining specific issues

- a. Do you like the heavy concentration on mining operation in this area?
- b. What is your general impression about surface mining activities in this area?
- c. How would you compare the housing standards provided by the companies to the old settlements?
- d. Are you satisfied with the social facilities, e.g. drinking water, schools, etc provided by the companies in your new settlement?
- e. Do you secured access to free information from the companies and other agencies with regards to their operations that affect your well- being?
- f. Are there established mechanisms for you to channel your complaints? Are these mechanisms reliable and enough?

C) Interviews with certain personalities in certain institutions

- a. A chart with Tarkwa District Lands Officer
- b. An interview with Tarkwa District Health Officer
- c. An interview with the Health and Safety Officer of Ghana Australian Goldfields Limited
- d. An interview with the National Director of the Environmental Protection Agency (EPA), Accra.

