

MASTER THESIS

**ASSESSING THE ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS OF LOCAL
MINING IN NORTHERN GHANA; BANDA NKWANTA IN THE BOLE DISTRICT AS A
CASE STUDY**

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ABSTRACT

It is significant to identify and assess impacts of major activities such as mining in order to mitigate the adverse impacts they create, as well as enhancing the favourable impacts. If not, as more benefits such as high revenues and infrastructure development are derived from it (mining) without caution, devastating issues would arise as a result of unsafe practices. However, mining activities have contributed significantly in uplifting several dimensions of development in developing world especially in Africa, Asia, and the Latin America. Infrastructure development, population growth, increase in employment and incomes, access to social amenities and luxury are some of the positive impacts derived from the mining. For those activities in Ghana, especially in the northern belt of the country, they are solely managed and regulated by the community members who are spearheaded by the traditional authorities in collaboration with committees. However, there are also negative impacts of mining, which may lead to serious consequences and catastrophes if care is not taken.

In the Banda Nkwanta and some other communities in Northern Ghana which are involved in mining, education is an important issue that is troubled since the attention of key players (teachers, parents and students) is on the mining activity and other ways of income generation and wealth. However, parents' incapability and sometimes unwillingness to pay the bills of their children is another factor that negatively affects education. Social problems such as prostitution, drug abuse, stealing and gambling, and conflicts are also among the negative effects that mining attracts to the operating areas.

Through participant observation, face-to-face interviews and focus group discussions with community members, it was identified that mining has contributed significantly to infrastructure and human development. Though it displayed adverse impacts such as those already mentioned, its favourable impacts are relatively more significant. Few people took precautions and personal measures to control the adverse impacts of mining, while others were not concerned about them even though they are aware of them.

To help enhance the positive impacts and mitigate the negative ones, several parties need to come on-board. Government, agencies in-charge of mining activities and the private sector should all collaborate with the community to put such mitigation measures in practice.

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DEDICATION

I dedicate this special document of my education to my parents, Mr. Issahaku Bigson Alhassan (father) and Madam Ramatu Issah (mother), and my siblings especially my brother, Shariffdeen, to my lovely wife, Zulphata Bin Yussif, and my beautiful daughter, Ameera Yelisung.

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LIST OF ACRONYMS

€	Euro
AFLS	Automatic Frequency Load Shedding
ASGM	Artisanal Small-Scale Gold Mining
CDEP	Community Development Employment Program
CSR	Corporate Social Responsibility
EPA	Environmental Protection Agency
GDP	Gross Domestic Product
GH¢	Ghana Cedi
GRA	Ghana Revenue Authority
HDI	Human Development Index
MMSD	Mining Minerals and Sustainable Development
NGOs	Non-Governmental Agencies
PNDCL	Provisional National Defence Council Law
SME	Small and Medium scale Enterprise
STDs	Sexually Transmitted Diseases
USD	United States Dollar

CHAPTER ONE: INTRODUCTION

1.1 Background

Mineral resources both contributed significantly to economic and social development of countries and at the same time create challenges such as environmental pollution and resource waste (Lei et al, 2013). Countries that are endowed with such resources are able to transform their economies and make life better for their inhabitants. In the global market, China is the leading economy in the mining sector both on fossil fuels (coal) and precious metals (gold, aluminum, copper, iron ore and bismuth), with the United States and Australia being the next to it in coal and gold respectively. This has contributed to China experiencing strong economic growth and also tremendous increase in human development due to the increasing prices of minerals it exports. Empirical results from a study on economic and social effects analysis of mineral development in China and policy implications indicate that, mineral development has provided more jobs thereby alleviating employment pressure in china (Lei et al, 2013).

Mineral mining is one of the major economic activities in most developing economies such as Botswana, Chile, and Mongolia. For the past two decades, mineral resources has contributed up to 20% of the Mongolia's Gross Domestic Product (GDP), twice the ratio of a decade ago (The World Bank, 2015). This resulted in an increase in employment of the working-age group in both large-scale and small-scale mining sectors. Botswana and Chile which are the most mineral dependent countries in the Sub-Saharan Africa and South America respectively, are not only experiencing high growth but also recorded the highest human development index (HDI) in those regions (McMahon et al, 2014).

In some developing economies in the African continent such as Ghana, Namibia, Zambia and Zimbabwe, the mining sectors has been and still is one of the major significant contributors to GDP and national development even when growth rates are lower. Within achievements in higher HDI, most of these countries have succeeded in making phenomenal investments in both health and education sectors which indicate that those sectors have not been ignored at times of booming mining economy.

Ghana is one the most vibrant mining economies in Africa, which is also the second country in gold production after South African. In the Ghanaian mining industry, the outturn of its mineral sector was relatively subdued in 2014. The output of gold, the predominant mineral expanded from 107.4 tonnes to 108.2 tonnes in 2013 and 2014 respectively, a rise of up to 0.7 percent. Even though it was a slow growth, the sector still contributed significantly to the country's economic progress in 2014 (Ghana Chamber of Mines, 2014: 5).

At the local level, the mineral and mining sector still remains the leading contributor to fiscal revenue, with a contribution of Ghana Cedi (GH¢) 1.24 billion representing 16.2 percent of the 2014 total direct tax mobilized by the Ghana Revenue Authority (GRA). A portion of these revenues are used in expanding primary developmental projects such as education, health and roads in host communities to enhance their well-being.

However, there are also problems and challenges in the mining sector just like any other contributor to national revenue. If not properly managed, the mining activity may devastate the community and beyond.

Interest groups including researchers and non-governmental agencies (NGOs) are seriously battling with mining companies in order to discourage their operations especially in developing countries (Friends of the Earth International, 2001). Mining companies and community members have a common interest which is profit and income, while environmental concerned researchers are opponents of mining operations. According to Sachs and Warner (1999), the weak quality of legal and responsible institutions results from high dependency on natural resource exports (cited in Amponsah-Tawaih & Dartey-Baah, 2011). It is therefore concluded in a review of oil, gas, and mining sectors that ‘...the best course of action of poor states would be to evade export oriented industries all together, and instead work to sustainably develop agricultural and manufacturing industries could provide direct benefits for the poor, and more balanced form of growth’ (Amponsah-Tawaih and Dartey-Baah, 2011: 67).

Additionally, those interest groups which are passionate about environmental safety are seriously calling for the cut-off of public financing for mining and fossil fuel projects with the reason that “ ... those industries do not foster sustainable development nor poverty alleviation” (Friends of the Earth, 2000 as quoted in Amponsah-Tawaih and Dartey-Baah, 2011).

Peru is one of the countries in the Latin America with tremendous boom in the mining sector for two consecutive decades, which resulted in significant decline in poverty rates. Despite the significant economic growth, the mining activities have been accompanied by high rates of social tensions (Loayza and Rigolini, 2016). Similarly in Ghana, several cases of conflict, which involve violence and to some extent the use of weapons, have been recorded in some urban and rural mining areas due to revenue and royalty sharing. These clashes have drastically affected the proceeds in the sector and economic development at large.

In almost all the mining communities in Ghana, large tracts of agricultural have been lost to mining activities (Hoedoafia, Cheabu and Korang, 2014). At the community level, the mining sector has also contributed to an acceleration of health problems, which include: malaria and respiratory infectious diseases, sensory losses, and Sexually Transmitted Diseases (STDs). Increased levels of drug addiction is another issue in mining communities as a result of continuous use of stimulants by mines’ operators in other to work extra hard to earn more revenue.

1.2 Problem Statement

There have been eruptions of different magnitudes of mining especially in rural areas, with most of them not being permitted to operate. Those without formal permission to operate are popularly known as ‘*galamsey*’ or literally known as illegal mining. However, it is referred as local mining due to local methods and low class equipment used for the operations. Most activities at the mining sites have destructive effects on the environment due to frequent use of machinery, equipment and to extend explosives (dynamites) and chemicals spillages. Despite the economic benefits derived from such activities, their negative social and environmental impacts can be overwhelming especially in low income countries. Both theoretical and empirical studies reviewed in this thesis reveal that, mining areas especially at the local level are prone to deviant activities such as prostitution, conflicts, and truancy among others. Besides, there are

many environmental catastrophes such as deforestation, erosion, air and noise pollutions within the communities and beyond. This study would either justify or oppose these previous studies by identifying the direct and indirect impacts created by the mining activity. If justified, those impacts need to be addressed and if possible interventions put in place to mitigate the negative impacts of the activity to make a blessing rather than a curse. And if not justified, further studies in other areas should be undertaken to identify the impacts the activity displays in those areas.

Given the relevance of identifying, understanding and comparing the impacts of mining, this thesis focuses on ***Assessing the Socio-economic impacts of Local Mining in Northern Ghana. Banda Nkwanta in Bole District*** is chosen as the area of field study, since it is one of the safest mining areas in the northern part of Ghana as compared to the other with high clashes and tensions between indigents and immigrants.

1.3 Research Objectives

The primary objective of the research is to identify and assess the social, environmental and economic impacts of local mining in the Banda Nkwanta community, by undertaking an empirical study and to suggest possible ways to help curb the adverse impacts.

In order to attain the primary objective of the thesis, the following specific objectives will be considered:

1. To identify and assess the social, environmental and economic impacts of mining activity.
2. To compare the positive and negative impacts of mining.
3. To identify recommendations for mitigating the negative impacts and enhancing the positive impacts.

1.4 Research Questions

To be able to achieve the above objective, the research will attempt to answer the central question: What are the social, economic and environmental situations of the community? This question is further elaborated by considering the sub-questions below:

1. What were the social, environmental and economic baseline conditions before the establishment of the mining activity?
2. What are the current social, environmental and economic conditions after the establishment of the mining activity?
3. Based on the answers of questions 1 and 2, what are the positive and negative impacts, and which category is dominant over the other?
4. What are the possible measures that can help mitigate the negative impacts and enhance the positive ones?

CHAPTER TWO: LITERATURE REVIEW

In this chapter, I present a critical review of previous studies that relates to my thesis to enable me identify the direction of my analysis and discussions of the empirical findings. The chapter is divided into three sections. The first section focuses on the social, environment and economic impacts that are directly and indirectly created by mining activities. The second section focuses on artisanal and small scale mining which is widely practiced in rural communities, and the third section focuses on possible interventions which could help improve the mining activity.

2.1 Social, Environmental and Economic Impacts of Mining

Mineral development has created new communities and at the same time wealth to those that already exist, but also caused significant disruptions in those communities and beyond. Progresses, losses and dangers that are created as a result of mineral development, which include mining activities, can be categorized into social, economic and environmental impacts.

2.1.1 Social Impacts

The mineral and oil extraction sector has not only increased employment, population growth, and per capita income, but also quality of infrastructure (Loayza and Rigolini, 2016).

According to Hunter et al. (2015), the mining sector in the early 1990s was not doing so well in indigenous labour employment until 2011. This was as a result of tremendous increase in the magnitude and sustained growth of mining which created many new jobs, and with the mining companies' realizing the necessity of indigenous employment as a social license to operate.

Census data for 2006 and 2011 was used to estimate the impacts of the mining with employment, personal and household income, and income distribution as indicators. Comparisons of mining areas and those without any mining activity in both remote regions and those that are not remote regions were considered in analyzing the economic outcomes of the activity (Hunter et al, 2015).

From the 2011 census data of Australia, it was realized that there is tremendous increase of the proportion between indigenous and non-indigenous working populations in all mining areas. An increment from 1.0 % to 1.7% of the indigenous working population in the mining sector was realized out of the overall increase in remote and non-remote areas from 1.7% to 3.1% and 0.7% to 1.3% respectively. For the non-indigenous working population, employment in the mining sector raised from 0.9% to 1.3% in total, out of the 7.9% to 11.6% overall increase in remote areas and that of non-remote areas from 0.7% to 1.1% (Hunter et al, 2015).

It is interesting that irrespective of the location of the working age population, remote non-indigenous working group have a high level of employment (85%). This implies that, non-indigenous working population moves to remote areas to work irrespective of the job category.

From the 2011 census data of Australia, total gross personal incomes of full-time indigenous and non-indigenous workers employed in mining and non-mining areas in both remote and non-remote locations were assessed. Average incomes of workers in

the mining sector are higher in areas with mining activities and areas without mining activities within the remote and non-remote regions as compared to the total full-time workers employed in the respective areas. According to Hunter et al, 'the fact that average personal incomes of those employed in the mining are higher in remote mining areas than in remote regions without mining activities for both indigenous and workers that are not indigenous suggests that, the substantially high demand for labour driven by a relatively high in mining sector in such areas leads to higher wages' (Hunter et al, 2015).

From the analysis for employment and personal income above, it is realized that, employment and average incomes are higher in mining areas than those in areas that are without mines. However, it does not outline how the activity (mining) has affected the distribution of incomes and people with less income. The proportion of households with low income of indigenous households is 8% more in non-mining areas as compared to mining areas for both remote regions and non-remote regions. But for the non-indigenous households, the proportion of low income households is 16% more in non-mining areas in remote areas, and 5% in non-remote areas (Hunter et al, 2015).

Hunter et al concluded that: the boom of the mining activity in the country (Australia) has contributed to significant increase of indigenous employment in the mining sector, especially in the remote areas. Mining areas has registered a higher average household's income of indigenous areas as compared to that of non-mining areas.

There are also establishments of health and educational facilities, and improvement of infrastructure such as roads, water and electricity supply and sanitation systems. These raise the living standards of the people and at the same time creates more employment opportunities in other sectors such as education, health and security (Hentschel et al, 2003).

Besides these gains displayed by the mining activities, there are problems as well. Problems and challenges usually include misunderstandings among mines operators at the workplaces, and also among members that are entitle to mining royalties. In Peru for instance, about 268 reported social conflicts have been recorded of which 38 percent were related to mining issues (Loayza and Rigolini, 2016).

Loayza and Rigolini also estimated that, about 46 percent of total Gross Domestic Product (GDP) was lost from the mining investment due to halt and prevention of large mining ventures from operation in 2014. Even though women are fully engaged in mining activities (Hoedoafia, Cheabu and Korang, 2014), they are the most overburdened due to lack of access to benefits such as royalties and employment (Loayza and Rigolini, 2016). Deviant behaviours such as: alcohol abuse, drug addiction, prostitution, gambling and infidelity have risen in most of the host communities and have contributed to high rates of domestic violence in the long run (Abdus Saleque, 2008).

2.1.2 Environmental Impacts

Currently, the most common global mining practice is the opencast mining, a surface mining technique with wide pit drilling which superseded underground mining in the middle of the 20th century. Even though opencast mining contributes up to 60% of the total materials mined globally, it still possesses more environmentally visible impacts than that of the underground mining (Abdus Saleque, 2008).

Mining can be seen as a short-term activity with long-term impacts on its location and beyond. Various stages of the activity from mine development and exploration, to final treatment create adverse impacts. These mainly include: vegetation losses, consequent erosion, changes in water table, high frequency noises, and air contamination (Abdus Saleque, 2008). These impacts are usually generated through the construction of roads and work camps at mine site, storage and transportation of ore, and improper disposal of waste (The World Bank, 2013).

At the local level, huge infrastructure are not usually constructed due to lack of license to operate at the same time, fear of their machines being confiscated by national security. Mine operators at the local level therefore relies on rudimentary implements such as pick-axe, chisels, pans and shovels, as compared to large scale and technology oriented mining where heavy duty machines such as excavators are used (Hoedoafia, Cheabu and Korang, 2014). According to Hoedoafia et al (2014), farmers who engaged in mining activities were able to increase their farms sizes as well as output by using mining revenue to invest on their farms. However, artisanal and small-scale gold mining as caused destruction to farmlands, water bodies and biodiversity (Arthur et al, 2016). Local mine operators are only bordered about how to make their ends meet, and usually don't pay attention to environmental sustainability. According to Arthur et al (2016), most local miners at the Prestea mining community in Ghana recommended that: government should legalize the all illegal mines with laid down rules and regulations.

2.1.3 Economic Impacts

Many low and middle income-mineral rich economies have experienced tremendous growth for a decade or longer, as a result of booming mineral export and rise in prices of those commodities (McMahan and Moreira, 2014). According to McMahan and Moreira (2014), mineral dependent countries go contrary to the accepted wisdom, which states that, the mining sector just like any other extractive industry can generate revenue but contributes little to sustained economic growth. Botswana and Chile, which are the most mineral dependent countries in the Sub-Saharan Africa and South America respectively, are the fastest growing countries at the same time scored high figures in Human Development Index in their respective regions (McMahan and Moreira, 2014).

In Mongolia, a rapid economic growth has been experienced, thanks to the contribution from the mining sector. In 2009, the total production output of minerals was 2, 936.7 million US Dollars (USD), with export at 1, 369.9 million USD and imports at 1, 566.8 million USD (Batchuluun and Lin, 2010). Similarly in Peru, the boom in the mining sector has generated revenues to the local governments in mineral producing regions which are derived from taxes and levies from mining companies (Loayza and Rigolini, 2016).

As mining activities prove to be beneficial for places where production takes place, they also contribute to poverty reduction. However, benefits from mining seem to be unevenly distributed and therefore has increased the inequality in mining areas. Moreover, proceeds are localized to producing areas with no spillover to non-mining areas within the same region or province, which then call for a new revenue sharing design (Loayza and Rigolini, 2016).

2.1.4 Summary of Mining Impacts

Mining has created diverse positive and negative impacts in the three dimensions of sustainability: social, environment and economy. As it has created different levels of employment and incomes in both remote and non-remote areas, various levels of conflicts and clashes have arisen due to ownerships and royalty sharing. Key social, environment and economic indicators which includes: health, education, population, security, employment, and income levels among others. Larger part of forest, farmlands and vegetation cover are lost to mining activities.

2.2 Artisanal and Small-Scale Mining

According to Hentschel et al (2003), a common definition for this particular type of mining has not yet been adopted; however, it is seen as a form of mining where operations are tackled by individuals, informal groups or communities, which is usually illegal. However, with the enactment of small-scale gold mining law in 1989 (PNDC 218), some activities within the boundaries of Ghana have been legalized (Hoedoafia, Cheabu and Korang, 2014). This particular activity is recognized in approximately 100 million locations in 80 countries globally and mostly identified outside the develop world especially Africa, Asia, South and Central Americas (World Bank, 2013). It is seen as one of the significant livelihood and source of income for local communities and poverty-driven populations (Arthur et al, 2016).

According to Arthur et al (2016), artisanal and small-scale mining has played a vital role in the expansion of the Ghanaian mining sector which resulted to its obtaining the second position in gold production after South Africa. Arthur et al realized that, 59.5% agreed to the fact that the mining activity has a positive effect of job creation to the people. Most of those interviewed also admitted that: food and water vending, gold and precious items manufacturers were other job opportunities created as a result of the establishment of mines. Even though greater percentage admitted that their income levels have increased significantly, they are also faced with challenges and problems such as losing of farmland to mining activities, and also exposed to accidents and diseases such as skin rashes, respiratory diseases, malaria and STDs.

Arthur et al (2016) further revealed that, most of the inhabitants especially women and children are engaged in the mining activity due to economic hardship. It also shows that, the activity has contributed significantly to livelihood enhancement through income generation, increased well-being and created opportunities for the establishment of private businesses. According to statistics, 1.7 million working-age people in Mongolia are in employment, with 100, 000 of them engaged in artisanal and small-scale mining, and about the same number also engaged in medium and large-scale mining (Batchuluun and Lin, 2010). However, injuries as a result of accidents and diseases are some of the negative impacts created as a result of mining. Mitullah et al (2003), argued that, artisanal and small-scale mining (ASGM) which is the dominant type of

mining in local communities rather diverts peoples' attention from agriculture due to low income returns associated with farming (cited in Arthur et al, 2016). Wilson et al (2015) used an Integrated Assessment framework in analyzing the economic, social, health and environmental data to co-develop reality-based response in collaboration with pertinent stakeholders of artisanal and small-scale mining in Ghana. Through the review of scholarly data of previous research on ASGM, Wilson et al. (2015) identified that: ASGM provides an important source of income for both indigenous and non-indigenous people. They further identified that, there is a positive correlation between agriculture and mining in income generation especially in dry seasons, since farmers usually switch to ASGM activities. However, negative consequences arise from ASGM activities both at the community level and beyond. Especially in the Bole district, there has been a rise in deviant behaviours which include armed robbery, prostitution, drug abuse and use of counterfeit currencies.

2.3 Possible Interventions to Help Improve the Activity.

Having reviewed the major favourable and adverse impacts of mining activities, there are potential interventions if implemented could help mitigate the adverse impacts of mining and if possible enhance the positive impacts.

Arthur et al. (2016) made three recommendations regarding to the sustainable livelihood approach in which research, policy and practice inform each other.

Firstly, national and local governments should cooperate with Environmental Protection Agencies (EPA) and the community to formulate and strengthen policies to limit destructive activities in the mines. This could be attained by adapting to proper and modern methods of mining operations. Secondly, there should be law enforcement by EPAs, minerals commission, and local authorities to protect lands that are reserved or used for non-mining purposes such as farming and residential construction. Thirdly, the government and the private sector should focus on reducing poverty and unemployment by creating an enabling environment for more job opportunities and investing in education and agriculture as well as rural industrialization.

Opoku-Ware (2010) pointed out that, the rampant increase of illegal mining in Ghana especially in local communities is as result of lack of employment in those areas. As it is against the mining law of the country, measures implemented by local authorities and national security are to swoop and brutalize illegal miners, which is perceived to be inappropriate (Opoku-Ware, 2010). According to Opoku-Ware, (2010), clashes are sometimes realized as local authorities and national security tries to swoop and brutalize illegal miners, since 'a hungry man is an angry man'. To help curb this situation,

Opoku-Ware therefore recommended that, activities of illegal mining should be regularized with the escort of monitoring and laid down standards of operation to help obtain a sustainable mining and peaceful co-existence between authorities and miners. To make it more profitable and beneficial, he further recommended that, periodic taxes could be negotiated between miners and authorities to generate revenue for developmental and/or mitigation projects at the community level (Opoku-Ware, 2010).

Wilson et al, (2015) proposed that, policies to improve social, environmental and economic status of communities by regularizing ASGM activities through partnership among stakeholders should be designed and implemented. This could be attained by specifically putting measures to improve and sustain the living conditions of ASGM communities for a longer period of time by

carefully designing interventions and implementing them. Improving environmental sustainability and enhancing the health of the people by providing incentives for miners and their families to enable them follow regulations properly.

CHAPTER THREE: METHODOLOGY AND RESEARCH DESIGN

This chapter explains how the study was undertaken from start to finish. These includes: the approach, the procedure and the step by step methods I used in tackling the entire research. The research design is an assessment of a case study which is an empirical study.

3.1 Research Framework

According to Verschuren and Doorewaard (2010:19), this tool is “a schematic and highly conceptualized representation of the stages that need to be taken in order to achieve one’s research objective”. Below are the steps I followed to construct the research framework.

- a. Characterize briefly the purpose of the research.
The study primarily aimed to assess the social, environmental and economic impacts of local mining through empirical study in the Banda Nkwanta in northern part of Ghana, and to recommend possible interventions that can help curb the adverse impacts.
- b. Identify the object(s) of the research and the part of reality you wish to study.
Mining activity in Banda Nkwanta, which is a mining community in northern part of Ghana, is the chosen research object of my study.
- c. Establish the nature of the research perspective.
The study both assessed the social, environment and economic impacts through an empirical investigation of previous and current status the study area, as well as identified the most dominant impacts (positive versus negative). According to Creswell and Plano Clark (2002:58), qualitative research is a research approach whereby the researcher explores an issue by collecting, analyzing, interpreting and drawing conclusions on views from participants (Creswell and Plano Clark, 2002). As my research seeks to investigate, understand and identify the impacts with regards to mining activity undertaken to improve livelihood, qualitative research is the design I chose since it is focused to understand, explore and discover issues in relation to natural settings. On the other hand, quantitative research design is specific, well-structured and has been proved to be reliable and valid, and therefore requires inductive logic (Kumar 2011). School enrolment figure and income levels were analyzed and represented in tables and charts.
- d. Construct a schematic diagram of the research framework.

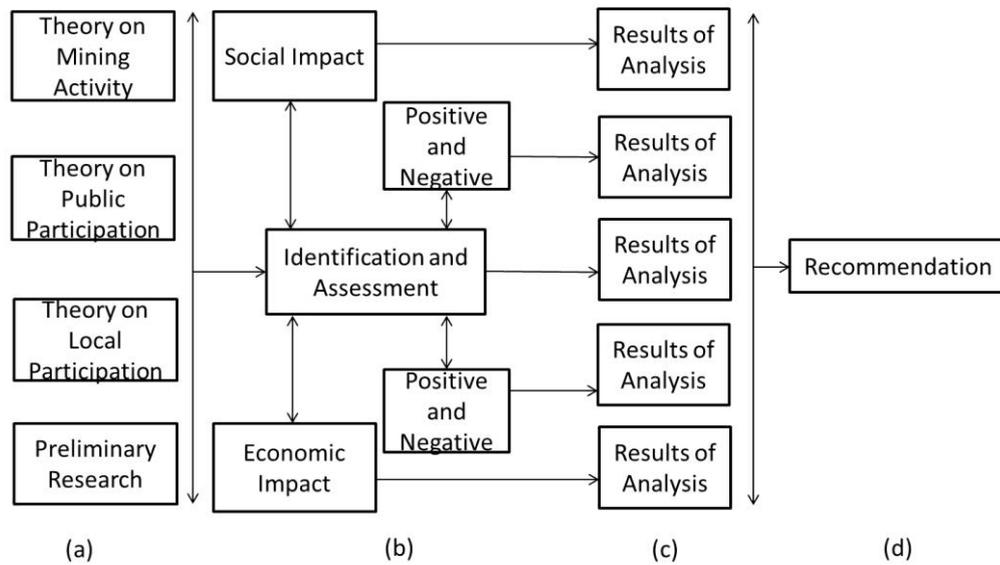


Figure 1. Schematic diagram of Research Framework

3.2 Definition of Concepts

The following key concepts are defined for the purpose of the study.

Artisanal and Small-Scale Gold Mining: This is a type of gold mining where by operations are undertaken by individuals or groups in small scale without any formal permission to operate.

Environmental Impacts: These are the effects (positive and negative) on the natural surroundings as a result of an activity. For the purpose of this thesis, the indicators considered are: noise, air quality, water, land and forest.

Local Mining: This is a type of extraction and exploitation of resources from the earth by unskilled personnel(s) with the use of implements and equipment other than heavy duty machinery.

Mineral Resources: These are pure inorganic substances found in the earth crust which occur through natural processes. Examples are gold, diamond, silver, etc.

Social Impacts: These are the effects on the social fabric of a community as a result of an activity. Indicators for this aspect includes: health, education, security, infrastructure etc.

Economic Impacts: Effects on the income and expenditure levels of members of a community as a result of a particular activity. Indicators for this aspect includes: employment, income level, cost of goods and services, etc.

3.3 Research Strategy

According to Verschuren and Doorewaard (2010): 156, this component of the research design refers to a “coherent body decisions concerning the way in which the researcher is going to carry out the research”. Since I undertook an in-depth, qualitative and empirical research, I chose case study as my research strategy.

3.3.1 Case Study

Among the several communities in Northern Ghana where mining activities are undertaken, Banda Nkwanta is one the most recent mining sites, where tools and equipment are mostly used for the purposes of digging and drilling, while dynamites and mercury are used for the blasting rocks and attracting gold particles respectively. The entire mining process is based on collaborations of various groups’ right from the site location up to the final stage which is the gold refinery. It is also one of the mining communities which to my knowledge have not been studied with regards to academic purposes.

3.3.2 Research Unit

The research unit is the local mining activity, which is undertaken in Banda Nkwanta in the northern part of Ghana, and therefore its stakeholders who include miners, community households, committee members, and some working groups in the community were the respondents considered. As the research objectives focus on the social environmental and economic aspects, the health, education and living standards as well as the state of the natural environment among others were focused.

3.3.3 Research Boundary

For the purpose of resource constraints, a larger sample size was not considered. Twenty households were chosen randomly. I also limited the empirical study within the boundaries of the chosen community, Banda Nkwanta. With regards to the situation of the community before the establishment of the mining activity, it largely depends on the time period the respondents were present in the community. I therefore considered the previous state of the community from ten years to the establishment of the mining activity in 2012. Right from the time it was established up to date which also covers the current state of the community.

3.4 Research Materials

This section deals with the necessary items and issues from which the data would be when undertaking research. The population where the study will be undertaken, the resources to provide the knowledge and information, and techniques to use in acquiring them (Verschuren and Doorewaard, 2010: p 23).

3.4.1 Sources

These are where the relevant data for tackling the research questions are gathered (Verschuren and Doorewaard, 2010: p 206). All the interviews were conducted in English and ‘waali’ which is a language spoken by the people of Wa in the Upper West Region in the northern part of Ghana. A translator was not therefore necessary since those groups and individuals interviewed could speak at least one of these two languages. For this research, the community members, mines operators, workers in the

public sector, are the primary sources of information. Households' information, education, health, employment, security and environmental issues about the Banda Nkwanta community were directly acquired from these respondents. Secondary sources such as the media (electronic and printed); empirical observation, recorded data such as school enrolments, and previous research directly or indirectly related to the study were also considered.

3.4.2 Data Collection Techniques

a. In-depth Interviews

This is a qualitative research technique that involves conducting intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program or situation (Boyce, 2006). This technique was one of the major techniques used throughout the research. Twenty (20) households were interviewed at their various about their personal issues. Most respondents for this technique are: the staff of the educational and health institutions, police, health personals, and household members. Traders, mines operators, people engaged in non-mining activities and elders of the community were also interviewed in groups with their respective interview guides. Apart from petty traders who were reluctant to reveal their personal issues especially their incomes, almost all the other respondents were participatory in all aspects. However, the each interview lasted between 10 to 30 minutes.

b. Nonparticipant Observation

This is the situation where the researcher is personally present in the field but only as an observer and therefore does not take part in activities under his/her study (Agyedu, Donkor & Obeng, 1999). I took a transient walk around the community and observed the activities. I also visited three of the eight mining sites in the community. On 27th July 2016, my last day in the community, I very much wanted to take part in on-site mining activities such as digging, chiseling and drillings, but it wasn't possible due time constraints. I saw it very risky to climb down the pits which are not less than 30 meters deep which was why I didn't attempt. However, I observed critically how the inland activities such as smoothing and sand washing were undertaken.

c. Focus Group Discussion

This is a very effective method of acquiring information from a group of experts in a particular subject at the same time. It mostly involves sharing of ideas or opinions base on the individual knowledge and/or experiences. One of its merits is that: it creates room for further explanations and scrutiny of issues for discussion. On 24th July 2016, I was able to use this technique to acquire the issues that are affecting enrolment in Darru Salam Islamic School, and vital information about petty trading from a group of market women. I also used this technique to acquire personal opinions of miners on the next day (25th July 2016).

d. Internet Search

Searching for published information online is one of the most dominant techniques of today's research. Most information related to a subject or an organization is usually uploaded on specific websites such as journals, digital libraries and social media. Global organizations, national organizations that have an affiliation with mining, local online news and other web-based information that might be of relevance to my study were explored. Almost all the literature reviewed was acquired through internet search.

3.5 Analysis of Data

The analysis of the empirical findings of the research is based on a comparative analysis of the social, environmental and economic states of the community before and after the establishment of the mining activity. The social and economic lives of the community with regards to good moral values, access to basic needs such as food, shelter, good health, income and security among others are compared.

3.6 Research Matrix

This is a tool used to represent a systematic and appropriate way of tackling a research, with emphasis on the research questions, methodology, required data and method of analysis (Regoniel P.A, 2013). Below is the representation of how the research questions were tackled.

Table 1. Research matrix

Research Questions	Acquired Data/Information	Data/Information Sources	Method of Accessing Data	Method of Analysis
1. What were the social environmental and economic baseline conditions before the establishment of the mining activity?	Previous Community Profile which includes, the area as: <ul style="list-style-type: none"> - A living place. - A social community - Natural environment - An economic community 	<u>Primary Sources</u> People: Mine operators, Long service workers in the community, indigenous people, households, traders, etc.	<ul style="list-style-type: none"> - Indepth Interviews - Focus group discussions 	<u>Qualitative Analysis</u> <ul style="list-style-type: none"> - Analysis of interviews and discussions. - Documents and content analysis
		<u>Secondary Sources</u> Published reports, research papers, and documents. Websites of institutions and agencies in charge of mining and environmental issues, etc.	<ul style="list-style-type: none"> - Documents and content Analysis - Web search - Literature Review 	<u>Quantitative Analysis</u> <ul style="list-style-type: none"> - Tables - Charts
2. What are the current social environmental and economic conditions after the establishment of the mining activity?	Updated Community Profile which includes, the area as: <ul style="list-style-type: none"> - A living place. - A social community - Natural environment - An economic community 	<u>Primary Sources</u> People: Mine operators, Long service workers in the community, indigenous people, households, traders, etc.	<ul style="list-style-type: none"> - Indepth Interviews - Focus group discussions - Participants' observation 	<u>Qualitative Analysis</u> <ul style="list-style-type: none"> - Environment and facilities observation. - Analysis of interviews and discussions. - Documents and content analysis.
		<u>Secondary Sources</u> Published reports, research papers, and documents. Websites of institutions and agencies in charge of mining and environmental issues, etc.	<ul style="list-style-type: none"> - Documents and content Analysis - Web browsing - Literature Review 	<u>Quantitative Analysis</u> <ul style="list-style-type: none"> - Tables - Charts

<p>3. Based on the answers of questions 1 and 2, what are the positive and negative impacts, and which category is dominant over the other?</p>	<p>Both Previous and Current community profiles. Data from question 1 and 2.</p>	<p>Same sources for question 1 and 2.</p>	<p>Extraction from the findings of question 1 and 2.</p>	<p>Qualitative Comparative Analysis</p>
<p>4. What are the possible measures that can help mitigate the negative impacts and enhance the positive ones?</p>	<p>-</p>	<p><u>Secondary Sources</u> Published reports, research papers, and documents. Websites of institutions and agencies in charge of mining and environmental issues, etc.</p>	<ul style="list-style-type: none"> - Documents and content Analysis - Web search - Literature Review 	<p>Qualitative Comparative Analysis</p>

3.7 Sampling

For researches that deal with population, a decision needs to be taken whether to include all elements of the population or select a sample to represent the whole population (Agyedu et al, 1999). This technique is mostly considered due to resource constraints. For the purpose of this research, I used the Simple Random Sampling method, which is the sampling procedure that gives equal chance to the elements of the population to be selected. This procedure focused more on households' selection and other income generating groups, for instance the petty traders. Purposive Sampling is another procedure that I used. With this method, respondents were selected based on their experience of various fields of the research which includes: health, education, and mining techniques among others. Among these respondents are headmasters, long term miners, mine sponsors, health practitioner in-charge and literate natives. Due to the time and resource constraints, a sample of twenty households were selected to acquire information on the social and economic lives of the inhabitants.

3.8 Challenges at the Field

There are often high possibilities for researchers to encounter difficulties or challenges in undertaking a research in the field. These challenges can sometime be foreseen before the start of the research, or realized during the execution of the research. Whichever way, they should be addressed and not overlooked. First of all, it was not easy to convince most people especially the illiterates to share information about experiences, personal life, opinions and issues about the community that are unpleasant. Due to recent undercover leaked documentaries by investigative journalists, most of the mines committee members were still scared even upon reading through my research letter, and a glance on my student identification card. Secondly, taxation is one of the issues that most petty traders are very scared of, and therefore any discussion that has to do with disclosing their income levels and business models are not always entertained. Finally, the cost of living in the community affected the entire budget of my stay. High charges for accommodation and high transport charges were the most expensive services I encountered which I was not aware of in advance.

CHAPTER FOUR: EMPIRICAL FINDINGS

This chapter presents the findings and empirical data acquired in the case study area based on the research framework. The first part presents the findings of the previous state of the community before the establishment of the mining activity. The second part presents the current state of the community after the establishment of the mining activity up to date. The third part outlines artisanal small-scale gold mining as practiced in the community. The last part presents the measures put in place to mitigate the negative impacts of the mining activity.

4.1 Previous State of the Banda Nkwanta Community before the Establishment of the Mines

This section presents the previous states of the community as narrated by the respondents. It is further divided into three sub-sections which cover the social, environmental and economic dimensions.

4.1.1 Social State

Before the mining activity, total population of the community was around 1,000, due to the frequent fleeing of most people especially the youth to other places for greener pastures and to seek employment opportunities. Members were not socially connected to each other, since it was hard getting their daily bread.

Education in the community has always been worrying as a result of several factors with regards to religious beliefs and parental disorders. The Banda Nkwanta community is predominantly a Muslim community which upholds most of the Islamic beliefs, and therefore enrolment to formal education has not been encouraged. *“Most females are given out in marriage as soon as they step into teenage, and others are authorized to switch from formal education to the Islamic education (Arabic classes) without completing the Junior High level”* (Headmaster, personal interview, 26th July 2016). At the same time, some parents have difficulty in providing domestic needs for their children, let alone educational needs. Other parents do not see it necessary because those who are able to reach senior high level fail to proceed to tertiary level and therefore turn to the same jobs that are undertaken by dropouts and illiterates.

The community was almost isolated from the district in terms of security patrols and police check points even though it is a settlement around a highway that connects the Upper West, Northern and Brong Ahafo regions in the Northern part of the country. This contributed to rampant robbery cases on vehicles and travellers on the highway. But within the community and among inhabitants, crime levels and deviant behaviours were under control due to the high acceptance of the Islamic values and teachings.

According to a male household respondent, most of the structures for both residential and communal purposes such as mosques were constructed with bricks and mud and roofed with thatch. Very few buildings including the Banda Nkwanta English and Arabic School were constructed with cement and blocks and roofed with cheap aluminium sheets. He added that, *“extended family system was practiced in the community even though there was arable pieces of lands in abundance for more settlements”* (Male respondent, household interview, 27th July 2016).



Figure 2. Previous residential structures in the community before mining activity. Research Photo: 26/07/2016.

According to a female respondent, some parents and children shared the same bed rooms due to lack of funds to put up more structures even in the same plot or compound (Female respondent, household interview, 27th July 2016).

4.1.2 Environmental State

The community was and is still blessed with fertile soil which enhanced crop farming and fresh weeds for cattle grazing. However, significant parts of forests were destroyed and still happening as a result of tree cutting for charcoal and domestic fuels (firewood), which is not actually related to mining. This has also unsheltered most forest animals which cause them to relocate to other places, and also the extinction of some herbicides for herbal treatments.

According to a health practitioner, malaria which is predominantly caused by mosquito bites has always been the major sickness that affects the community members (Health Practitioner., Personal interview, 26th July 2016). She added that, discharged stagnant waters from homes as well as those discharged after sand washing by miners are breeding places for mosquitos. Most of the cases on records before 2012 were those below the age of twenty (20), and pregnant women.

4.1.3 Economic State

Before the establishment of the mines, most of the inhabitants were fully engaged in agriculture, which includes crop farming, rearing of animals, hunting, chopping of firewood and charcoal burning. Few members were into trading of farm products and domestic provisions, and very few were in white colour jobs such as teaching. Out of the twenty (20) households, thirteen (13) of them solely depended on crop farming as their main source of livelihood, while the rest depended on petty trading. According to a household male respondent, most of the families in those days (before mining) depended on incomes generated from family farms only (Male respondent, household interview, 27th July 2016).

4.2 Current State of the Banda Nkwanta Community.

This section deals with the responses from key respondents and my observations throughout the community, about the state of the community after the mining activity have been established. According to a male student in a focus group discussion, the mining activity was established in the middle of year 2012 (Male Students in Junior High School., Focus group discussion, 25th July 2016).

4.2.1 Social State

a. Population Growth

In most African countries, including Ghana, population growth is expected at areas where mining and other resource activities takes place due to influx of workers into those areas. From the responses of three indigenous people from separate households, most of the indigenous people fled to the southern part of the country for greener pastures, which further reduced the population from time to time. But as soon as the mining activity was established, immigrants from diverse tribes and locations migrated to the community to tap the benefits of the resource (gold). Four (4) out of the twenty (20) households said they invited their family members from other places which further increased the number of household members. One male respondent also emphasized that, the sudden increase of birth-rate played a part in the tremendous increase in households' sizes and population as a whole. From my personal observation, most of the immigrants sheltered themselves at a particular side of the community termed as "rubber estate". This term was derived from the rubber materials used to fix tents and other temporal structures for shelter.

b. Employment

The Banda Nkwanta community is now an area with diverse income generating activities including those that were practiced before the establishment of the mining activity. It can now boast of: two financial institutions (Ghana National Bank and Ebenezer Cooperative union), numerous small and medium scale enterprises such as provision shops, mobile phone retailers, food vendors, groceries sellers, motorcycle and spare parts retailers, etc. According to a mine worker, there are more than 300 people working in the mines. The females are mostly the cooks at the sites, while the males are the owners, sponsors, chisellers, crackers, grinders, security men, etc. However, some people are still engaged in their usual crop farming and charcoal burning even though most natives of the community especially the males shifted from their previous occupations to the mining sector. All the twenty (20) households have at least one household member working directly or indirectly at the mines. Most of them work at the mining site while others work on the products that are brought for further processing.

c. Health

Currently, there are numerous complaints of chest pains especially from male workers in the mines. These chest pains are always accompanied by coughs which later result in headache and sneezing. These issues are as a result of vigorous works they undertake, such as manual drilling, digging, gathering of heavy rock particles and inhalation of dust particles, as well as the hard drugs taken to stimulate them to work harder. There have also been a number of STD cases, which result from rampant unprotected sexual relations among the youth. The community was not an exception of the 2014 cholera outbreak that hit most parts of the Ghana. Most of these cases apart from the malaria and fever are usually referred to the district health facility due to the low standard of the health facility in the community.

d. Education

In most rural communities like in Banda Nkwanta, due to financial constraints most parents find it difficult to cater for their wards at the same time afford their school fees and other charges. Some others prefer their wards to assist them in generating income rather than schooling, even though they could afford those charges involved. Some students on their own preference decide to join their friends who are not schooling to earn fast income rather than being in school.

All the headmasters from the four schools in the community have attributed the low schooling level most of the blame to the mining activity, since it has attracted the attention of both adults and young including school going ages from near and far.

However, the community is blessed with four separate schools which include: Banda Nkwanta English and Arabic School, Banda Nkwanta Roman Catholic School, Darru Salam Islamic School, and Dawah Islamic School.

The Banda Nkwanta English and Arabic School was the first school to be established in the community by the Government of Ghana. It has students occupying all the basic stages in education which includes kindergarten (KG), primary level, and junior high level (JHS).

Banda Nkwanta Roman Catholic School was the next school established in the community by the Catholic Church. However, its current students occupy kindergarten and primary levels only, (no JHS).

Dawah Islamic and Darru Salam Schools are private schools established to educate pupils on both formal education and Islamic education.

Below are summary of the current enrolments of the schools in the community.

Table 2. Total enrolment of students in the community

Level of Education	Boys	Girls	Total
KG/Nursery	349	328	677
Primary	303	358	661
Junior High	35	33	68
Total	687	719	1406

However, teacher deficiency and ineffectiveness is also a contributing factor to the decline of education in the community. Even though most of the schools lack teachers, some male teachers are partially engaged in the mining activities, which take most of their time including week days. This therefore reduces the performance in school activities and also leads to truancy and absenteeism of students.

e. Security

The community can now boast of a twenty four hour police patrols team which is stationed in the community. The team assist in maintaining peace and order, and at the same time monitor moving vehicles through the highway. Aside the work of the police, the leadership of the community which is spearheaded by the chief and his elders have installed disciplinary measures to maintain peace and order in the community. According to a male student, *“During the early stages of the mining activity, there were significant number of robbery cases in the outskirts of the community, not only to intersect mining proceeds, but goods and passenger vehicles were also targets by robbers. But now that there is a 24 hour patrol team stationed in the community, robbery and theft cases has reduced drastically”* (Junior High School student, Focus group discussion).

f. Infrastructure and Shelter

As stated previously, before the mining activity, the community was a typically deprived area that lacked most infrastructural development. But now, close to 100% of permanent buildings for residential and business purposes are constructed with cement blocks and roofed with aluminium and raincoat roofing sheets. According to a male respondent, and from my personal observation throughout the community, almost 90% of all mud and thatch houses have been rehabilitated with blocks and aluminium sheets. There are a number of guest houses for traveller and people who wish to stay for a few of days in the community.



Figure 3. Current residential structures in the community. Research Photo: 26/07/2016.

g. Social Vices

‘What are the social vices that arise or worsen as a result of the mining activity?’

All those asked this question admitted the alarming rate of prostitution and further expressed their displeasure about the minors involved. The act is commonly practiced by the immigrants, especially those located at the rubber estate where activities are not monitored regularly. From my observation, it is usually practiced at night at hidden sections of the community. Most of the people involved practice it undercover and others in the outskirts of the community. According to one of the headmasters, this has resulted in a number of teenage pregnancies, which further led to school dropouts.

Even though I saw a few of people smoking cigarette both day and night, but majority of those who takes the hard drugs are those at the mining site. In a jovial interaction with some miners, marijuana is popularly referred as “*energy*” or “*power*”, since that is what is derived from the substance when smoked. Most of them confessed that it gives them sleepless nights, but they also admitted that they cannot work effectively without taking it.

4.2.2 Environmental State

Large portions of the community’s forest and lands have been destroyed for mining and residential purposes, and new areas are yet to be established.

Due to gravel digging, mining activities and constant usage of the river water by animals and builders, the river is polluted and therefore for cannot be used for domestic purposes. The farmers in the community rely on seasonal rains for farming and therefore do not depend on the river water for irrigation purposes.

In the community, access to clean air is a challenge not just because of the mining activities within and in the outskirts, but also the frequent usage of the highway by both heavy duty and passenger vehicles. Exhausts fumes from vehicles in addition to dust from mining and gravel site pollutes much of the air in the community.

Most people do not recognise noise as pollution probably because is not visible even though it could lead to health implications like hearing defect. Unfortunately, the common market is ten meters away from the highway which doubles as a lorry station, this therefore disturbs traders and buyers as noise and fumes from moving vehicles are emitted directly to the market and residents nearby.

“We wish the lorry station could be relocated. We are fed up with noise and all kinds of fumes emitted by old engine vehicles. Some of us are even suffering from coughs and hearing problems” (Female respondent, Petty trader, 27/07/2016). Heavy sounds are also emitted from mining sites as a result of using deep drilling machines and blasting of dynamites.

4.2.3 Economic State

Due to massive investment in the mines, more economic activities and cash flow have increased tremendously which resulted in high income levels. According to some mines workers, those who drill the crust for blasting, and those who further crack the stone into cheapens both earn up to Gh¢ 2,000 (€ 470) per month during bad seasons and Gh¢ 20,000 (€ 4.700) during good seasons. When petty traders in the market were

asked about their income levels within the past six months, their responses were as shown in the Table 4.1.

Table 3. Income range of randomly selected petty traders.

Petty Traders	Income range per month (Gh¢)
Groceries Seller	1,200.00 – 2,500.00
Food stuff Seller	1,500.00 – 3,000.00
Cooking utensils Seller	1,000.00 – 3,000.00
Food vendor	2,500.00 – 4,000.00
Provision store Seller	1,400.00 – 2,500.00

According to a female respondent whose husband is a fulltime yam and maize farmer, they “usually sell half of the proceeds to earn about Gh¢14, 000.00 (€3.294) each season”.

Most of the white collar professionals that include teachers and health personals receive between Gh¢900.00 (€210) to Gh¢1,600 (€375) depending on the rank and number of years they served in the service. However, prices of goods and services are higher in the community as compared to nearby areas such as Bole and Sawla which are towns within the same region with the Banda Nkwanta community. These are prices are as a result of high incomes gained due to the mining activity

4.3 Artisanal and Small-Scale Mining in the Banda Nkwanta Community

Almost all the mining operations in the Northern part of Ghana including the one in Banda Nkwanta are guided by rules and regulations which are established by a committee in-charge of the mining activities. For instance, any immigrant who intends to take part in the mining activity must first seek permission from the committee in-charge.

The mining activity involves steps and procedures, which are undertaken by 11 different groups of people.

4.3.1 Groups Involved in the Activity

As already indicated, the mining activity is coiled with stages and procedures, and therefore there are 11 groups of people who handle each stage of the activity.

Table 4. Group of people of the mines with their respective tasks.

SN	Group	Role
1	Owners	Discover the site suitable for mining. They are also the right owners of the area to be explored.
2	Sponsors	Provide materials and equipment for the operations.
3	Chisellers	In-charge of digging and drilling to reach the crust.
4	Hole makers	Granding the pitch with wood to keep it in-shape and to avoid collapsing.
5	Blast men	Set the dynamites to blast the crust.
6	Loco boys	Gathers the pieces of the crust after blasting.
7	Sump boys	Crack blasted pieces into smaller stones.

8	Smooth boys	Grinding smaller pieces of stones into powder using a smoother.
9	Cooks	Prepare food and other eateries for workers.
10	Security man	Watch after the site in the absence of workers.
11	Gold buyers	Purchase the final resource (refined or unrefined)

All these groups and some others not included are all entitled to the proceeds at the end of a complete activity.

4.3.2 The Mining Process in the Community

There are eight mining sites in the community, with each referred to as a 'part'. In each part, there are several spots which are owned by individuals or groups depending on the establishment. Then the sponsors partner with owners by providing the necessary materials and equipment, which include chisels, compressors, dynamites and foodstuffs for the operation. Then the chisellers lead by a gang leader, start the work by digging and chiselling vertically to reach the crust. They work hand-in-hand with the hole makers who grand the pitch with wood the prevent it from collapsing, and also to ease continuous digging to reach the crust. After reaching the crust, the chisellers bore holes on it to fix blasting materials such as dynamites, ropes and caps. Then blast men sets fire on the ropes from the earth surface which burns down to reach the dynamites in the crust, then blasting takes place. In case of no blast or an incomplete blast (miss fire), the blasting process is repeated until a successful blast in achieved. Crust particles are carried out from the pitch to the earth surface by loco boys for cracking to take place, after which the cracked particles are conveyed to town in fertilizer bags for sharing to take place. All the groups involved in the mining activity are entitled to shares with their respective ratios. The committee and royalties for community development are also reserved during the sharing. The various groups then further share the proceeds among themselves (individuals). Some individuals may decide to sell their proceeds to interested buyers, while others give it out to sump boys for further processing. The sump boys further crack the stones into smaller pieces, after which they are grinded into rough powder by the use of a crosser. A smoother which is operated by smooth boys is used to further grind them in to soft powder. The sump boys then set up a structure which is used to wash the powder to trap the gold particle with the aid of a blanket and a cloth. Mercury is then used to attract and mould the particles together to form a single piece. The gold piece is then roasted and scaled, and the displayed figure is divided by 0.8 to get the actual weight of the gold, and then sold to a buyer. Currently, one blade weight is priced at Gh\$100.00 (€24).

Below is schematic diagram showing the various steps involved in the mining process.

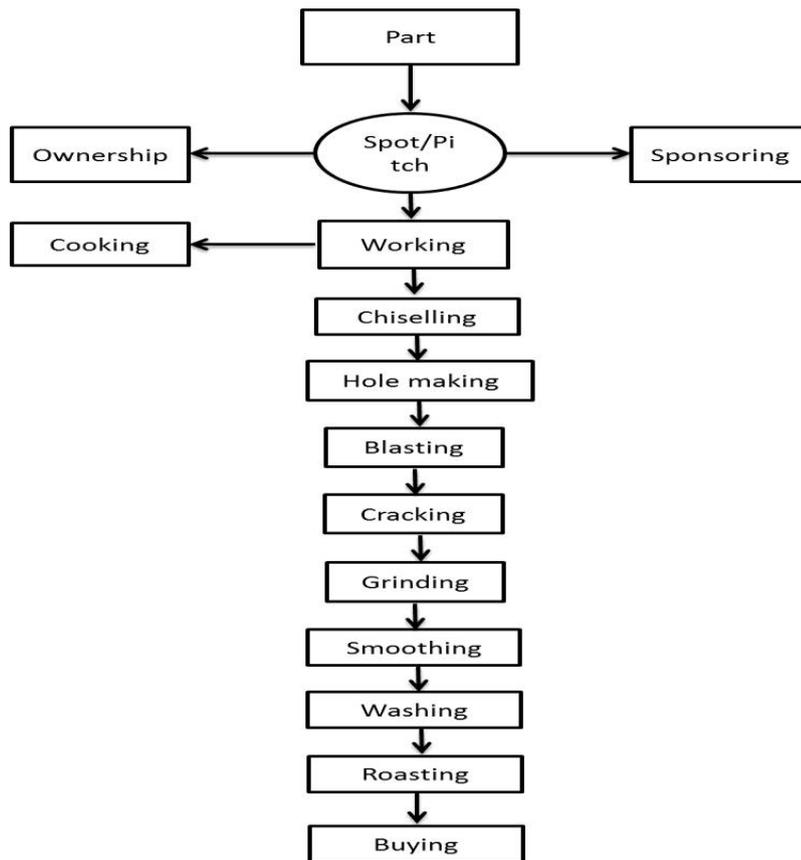


Figure 4. Flowchart of the mining process.

4.4 Measures to Help Curb the Adverse Effects in the Banda Nkwanta Community.

This section identifies the measures the community has put in place to handle the adverse impacts in the community that are caused by the mining activity. It also includes individual measures that members have put in place to cope with those impacts. It is further categorized into social, economic and environmental measures to assist controlling or coping with adverse impacts.

4.4.1 Measures to Control or Enhance the Social Impacts.

As already stated, the mining activity is one of the major activities in the community that has left both positive and negative footprints. It is therefore necessary to devise measures to attend to the issues that affect the lives of the people. As noted already, prostitution, teenage pregnancy, school dropouts, and drug abuse are among the negative influences of the mining activity even though the norm of the community forbids them. According to five respondents, intensive caning and some other basic punishments are the measures they implemented to discipline their underage children. The rest responded otherwise of not implementing any disciplinary measures to control or prevent their children from indulging in those acts. Also, the mining committee has banned school going age (those below age 18) from participating in any activity with regards to the mining. This has not only prevented them from dropping out from school, but also safe them from the use of hard drugs since they serve as stimulants to enable hard work. Religious classes that are organized for basic students have adjusted

their teachings to include sex education, in order to create the awareness of the risks and dangers involved in premarital sex relationships. Through the intervention of the government, a 24-hour police patrol team is stationed in the community to check and control crimes.

4.4.2 Measures to Control or Enhance the Economic Impacts.

As the prices of goods and services escalate in mining communities, more and more people work extra hard and also more time to earn more to cater for their needs and wants. At the same time, the growing population which also affects the employment figures are also handled through further discovery of more sites for mining. According to the 20 household respondents, *“we work hard to increase our output and the same time to increase our incomes. We also sometimes reduce our wants and desires at times of difficulties such as low incomes”* (Household respondents).

4.4.3 Measure to Control or Enhance the Environmental Impacts.

In all the environmental dimensions which include land, water and air, all the interviewees responded that, they have no coping measures in place to deal with noise and fumes that are emitted by moving vehicles. However, three of the traders said they have plans of relocating to a different place should the case worsen. In all the mining sites, all exhausted pits are closed and refilled with gravels to prevent land deterioration and potential earthquakes. Those who work on the further cracking of stones (sump boys), and grinding into powder (smooth boys) do not have any mechanisms in place to avert the noise produced at various stages.

CHAPTER FIVE: ANALYSIS OF FINDINGS

This chapter presents the analysis and discussions of the empirical findings from the study area as presented in the previous chapter. The first part of this chapter compares the favourable impacts of the mining activity and that of its' adverse effects on the community and its' members. The second part of the chapter analyses the various categories of social and economic impacts as outlined in the previous chapter. The last part briefly analyses the environmental impacts of the before and after the mining activity.

5.1 Analysis of the Impacts of Mining.

This analysis is based on the qualitative comparison of the various states of the community with the presence and absence of the mining activity. Even though such activities are purposely to trace natural resources, they equally leave behind large amount of destructions on other natural resources. Undoubtedly, the mining activity has destroyed large part of forests and lands which would have served the purposes of animal habitation and crop farming respectively. It is very possible that, more lands and forest cover would be destroyed to establish more sites in case the current sites are exhausted. Though the mining activity has no connection with the community river, it is however polluted as a result of other activities nearby such as gravel digging and drinking water for farm animals. As a result, no water body seems to be present due to the presence of large amounts of pollutants. Based on my personal observation, it is admitted that drilled pits are shuttered down by refilling it with gravel or surface sand after the exploration is over. However, there is no guarantee that minor earthquake would be prevented. For the four years of operation, one can say the current impact of the mining on the land and forest is bearable, but as it continuous, there would be serious destructions which would lead to further loss of vegetation.

5.2 Social Impacts of Mining on Banda Nkwanta

Even though the mining activity could be seen as a recent operation if compared to other operations in Manwe and Goripia in the Upper West Region which were established on 2004 and 2006 respectively, its' significant impacts in the community within this short period are unimaginable. Beneficiaries would turn to forget or underrate the adverse impacts that are displayed by the mining activity when the favourable impacts are realized. These impacts which are socio-economic and environmental in nature have both positive and negative effects on livelihood in the community.

5.2.1 Employment

In the Banda Nkwanta community, the only jobs in the mines that are feminine oriented are cooking and gold trapping with mercury. The rest such as chiselling, cracking, digging, gathering and blasting are specifically for male adults due to the vigorous nature of those works. However, economic activities such as petty trading and food vending are those that most women fully undertake. This implies that, feminine employment and occupation is relatively high in non-mining activities, but very low in the mining sector. Due to high illiteracy rate especially among women, most of the white colour jobs in the community which includes teaching, health assistance and financial clerks have realized low staff figures for women. On the contrary, women who are ready and willing to seek for jobs within the community are capable of finding one. Upon the petty trading, some wives from time to time do assist in the family farms to

increase the workforce and family output as a whole. This implies that, even though the mining activity is now the major activity in the community, some people especially the women and old aged men are not relying on it as a source of livelihood.

Admittedly, the large population of those involved in the mines (chisellers, crackers, etc) are immigrants. Most of the indigenous people involved are either sponsors or owners, and which also doubles as the committee members of the mining activity.

5.2.2 Population Growth

As a result of mining activities in communities, influxes of immigrants in to those areas have heightened due to the search for employment and resources benefits (Opoku, 2010). Increase in birth-rate as a result of teenage pregnancies has also contributed to population growth at the same time increased dependency ratio, since most of those are underage and unemployed. These massive increases in population have contributed to a further increase in the workforce in those communities even though it could results in high unemployment rate.

5.2.3 Infrastructure Development

In areas where population growth is increasing and expected to increase more, potable drinkable water, good roads, well equipped health facilities, schools with good human and material resources, and others are highly expected in order to improve the living standards of the inhabitants. It was testified by all the twenty respondents that, the mining activity has greatly contributed to the existence of the above mentioned amenities even though they are not up to the highest standard. Once the operation is undertaken and regulated by the community (no interference of mining companies, government), most of the incomes and royalties are used in developing the community under the supervision of the committee. Most indigenous people as a result of high incomes and appetite for luxury has rehabilitated their places of residence and furnished them with luxurious items. Through the effort of the community members, electricity has been extended to all corners of the community. By the community standard, better schools and a good health facility has been established to enhance better lives in the community.

One would argue that the mining activity and other economic activities have destructed teaching and learning in the community. However, the intervention of teachers and committee members has deterred students and young age group from involving in tedious activities which have reduced child labour.

5.2.4 Education

This important key to success is usually low in local communities where mining activities happens to be dominant, with the reason being that, young children abandoned the school in order to take part in income generating activities. However, in the Banda Nkwanta community, low enrolments are due to poor parental care and truancy.

Below is a graph representing a summary of all schools enrolments in the community.

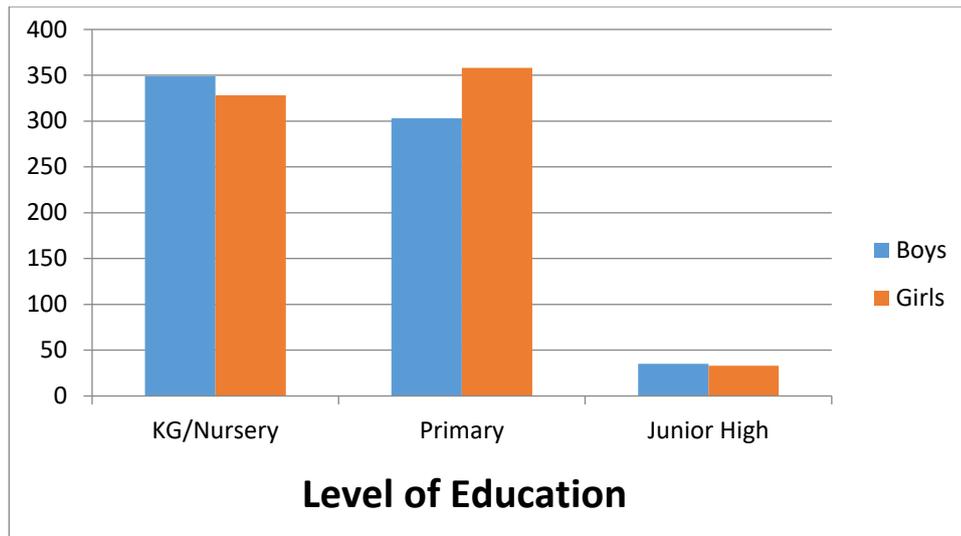


Figure 5. Graph representing student enrolment in the community.

From the table above, the total number of students in all the four schools in the community is 1,406. 687 of them are boys which represents 48.86% of the total enrolment, while 716 of them representing 51.14% of them are girls. This implies that, more females are enrolled in school than males. Also, the total number of enrolment in the early childhood level is 677 representing 48.15%, 661 out of the total enrolment representing 47.01% are in the primary level, and 4.84% represents those in the junior high level. Unfortunately, there is only one school with a junior high level, even though the private schools have only enrolled up to the lower primary level. One would wonder why enrolment decreases from the early stage to the upper level. According to the school teachers, as time goes on, some students go on transfer to schools outside the community, and others drop out due to diverse reasons. As economic activities are booming, education is not being patronized once everyone including teachers and pupils are eager to enrich themselves.

5.2.5 Health

Even though there are a number of complaints about dust and fumes that erupt from mining and gravel sites, and lorry station, there are low prevalence of diseases that are associated to mining such as typhoid and respiratory diseases. The general health in the community is quiet better in terms, as compared to others sites in the southern part of the country. However, minor accidents from the mining sites have been recorded, without any serious consequences such as death, paralysis and body deformity.

5.2.6 Conflicts

Crimes and conflicts in the community are relatively low due to the high vigilance of the peace keepers, and the acceptance and love for peace by the inhabitants. However, petite crimes such as mobile phone theft and small scale conflicts especially among miners and sometimes drivers in lorry station are very rare. However, some communities in the same district have experience deadly clashes between royal families and other groups over mining royalties. There have also been deadly fights between

miners over ownerships of mining pits. Fortunately, these issues are totally absent in the Banda Nkwanta community, which therefore justifies that, the community members, miners and committee members are all contributing their code of conduct of good behaviour.

5.3 Environmental Impacts

The destruction of large amounts of farmlands and forest has resulted in significant loss in biodiversity, fertile soil, and forest resources. However, the community members especially those directly involved in the destruction of the environment fail to realize the consequences of these destructions. The third part of the mining activity which is the washing of the powdered sand with water to extract the mineral particles is carried out in the township. In this process, stagnant and polluted water are produced around the sump, which could be a breeding source for mosquitoes. Miners also fail to realize that, refilling exhausted pits is not enough to reclaim destroyed natural resources. What about the forest that is lost, and what are they doing to reclaim it? Their main objective is to reach the mineral safely, and therefore the environment is not their priority. Apart from their farm animals, the community does not depend on water bodies for their source of drinking water and domestic purposes, since there are now bore-holes in the community. They therefore do not see it necessary to change their income earning activities (gravel and sand drilling) just protect a river that is not depended on. What they fail to realize is that, the underground water which is siphoned by the bore-holes could be polluted as a result of unsustainable mining activities.

5.4 Economic Impacts of Mining on Banda Nkwanta

Personal incomes are relatively high in mining areas as compared to non-mining areas irrespective of the activity involve. According to a research on the economic impacts of mining on indigenous and non-indigenous Australians, average incomes of the workers in mining areas, as compared to those in the non-mining areas are higher (Hunter et al, 2015).

Table 4.1 shows various occupations against their respective average income per month.

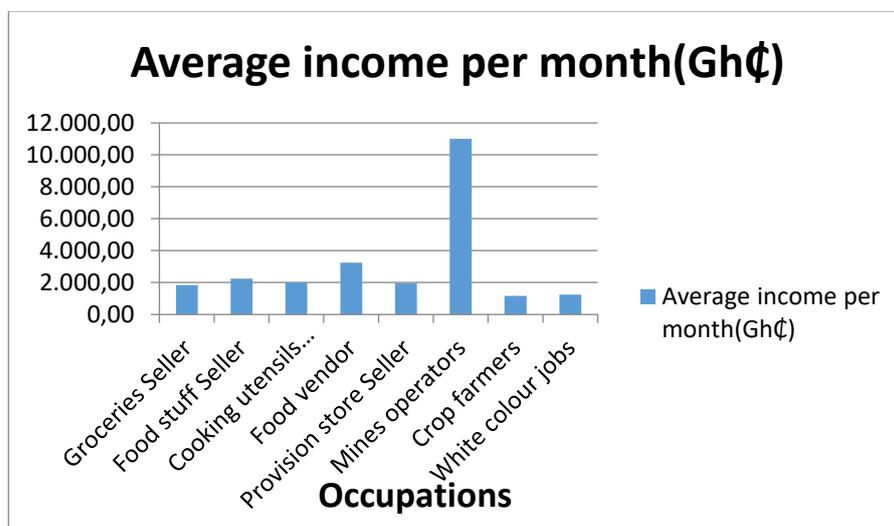


Figure 6. Average monthly incomes of selected occupations in the community.

From both table and graph, it is clearly realized that incomes are relatively high in the mining sector at all times. The white colour jobs are those that bring low incomes, due to taxes and other charges on the payroll. This has inspired some of white colour employees (especially teachers) to take part in the mining activities as a part-time job.

5.5 Mitigation Measures

With reference to chapter four (section 4.4.1), it is clear that, controlling measures for social vices are mostly implemented by household members. As testified by 5 respondents, punishments are the measures they apply when a child engage in the act. One may ask what if the act results into something more serious, such as pregnancy, STDs etc. Is it still punishment? If not, what would be done?

None of the levels of government shows concern about the mining activity in the community. Whether any of the levels or the government bodies' in-charge of mining is aware of the operation is another issue. This therefore has led to unsustainable methods of mining since almost all those who work in the mines are illiterate and unskilled. Most of those who use the advanced machines are not experts in using them, and as a result of this improper usage, more destruction such as deforestation and unnecessary pits are created. There should therefore be technical mechanisms to deal with adverse impacts that the mining activity creates both on site and uptown.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This thesis assessed the environmental and social, environmental and economic impacts of the mining activity in the Banda Nkwanta community. It also compared the positive and negative impacts of the activity and identified the impacts that are more dominant, which is the positive impacts. Finally, it identified measures, which could help control the negative impacts as well as enhance the positive ones.

Having assessed the impacts of mining in the Banda Nkwanta community, it can be concluded according to the primary data that, mining has contributed significantly in raising people's incomes and increasing infrastructure development. Mining activity is composed of a number of steps with each of which are assigned to different workers. This division of labour has tremendously raised employment levels and further increased the standard of living of the people as a result of high incomes and access to social amenities. Population increase as a result of immigration as increased the work-force of the community.

However, mining also has negative effects on both the natural resources of the community and the livelihood of the people. These effects that are displayed by this kind of mining are similar especially in developing and deprived areas. The Banda Nkwanta community has equally received its share of the negative impacts of mining. Even though the school enrolments were previously not encouraging, the activity has worsened the situation by not only attracting the attention of students, but also some staffs of the various schools. Prostitution, which was almost non-existent in the community, has now risen due to population increase with diverse culture and values as well as high income levels and entertainment. Rampant drug use by vigorous workers and hardworking labourers especially miners, drivers, wood loggers and hunters have increased in their various workplaces. High standard of living especially high prices of goods and services is seriously crippling the vulnerable, and as further resulted in increasing the poverty level of some members. Underground water system through a number of installed bore holes is the main source of water for domestic purposes. Large part of the forest and vegetation cover which could have served agricultural purposes is lost due to mining expedition. Though activities such as gravel digging and trees logging for charcoal burning have contributed to deforestation and land degradation, significant part of these impacts results from mining activity. The final environmental impact is noise and the fumes emitted from vehicles, as a result of both the market and lorry station being located at the central point of the community. As part of measures to help mitigate the adverse impacts of the mining especially at the sites, exhausted pits are also refilled to avoid further land deterioration, accidents, and unplanned wells in those areas. Also, a committee has been put in place to direct the affairs of the mining and some other related activities that has to do with community development.

From the comparison between the positive and adverse impacts of by the mining activity, which is based on my personal observation, responses and expressions of interviewees, and qualitative and quantitative analysis of empirical data, I therefore conclude that the positive impacts enjoyed by the community are significantly greater than that of the negative impacts that they suffered. However, the negative impacts should not be underrated.

6.2 Recommendations

To mitigate the adverse impacts, while enhancing the positive impacts of mining, I suggest the following recommendations which could be useful to the community and its members, the regional and national authorities, and other areas that might be facing similar issues.

6.2.1 Social dimension

Both the national and local governments should join forces to regulate the activities of local mining in the various practiced areas. Most of the communities practicing this type of mining especially those in the northern part of Ghana are not recognized by the government. This has led to clashes and significant destruction both in infrastructure and natural resources. Regularizing these activities could address and if possible avert these deadly issues that arise as a result of lawlessness in these undertakings.

Agencies that are responsible for mining and issues regarding natural resources should extend their quotas to cover the activities of local or artisanal mining, especially those that are illegal. Formulating rules and regulations to be implemented by local authorities and committee members' in-charge of the activity could assist in enhancing sustainable mining in at the various sites which would decrease the adverse impacts.

Health education and forums needs to be organized in the community for all levels of the community members in order to boost their understanding to realise the dangers they are putting themselves. Miners and market traders should be cautioned that there are severe effects such as tuberculosis even though not identified in Banda Nkwanta, but could be acquired through mining activities and exhaust fumes.

People who migrate to mining areas have diverse intentions of making wealth or ends meet. When some are thinking of using genuine ways to obtain desires, others are making plans of achieving them through immoral acts such as prostitution and gambling, irrespective of the consequences. Local authorities should therefore put structures in place to check the calibre of immigrants that troops in to the community. Interrogating the immigrants through intensive interviews to know their intentions and how they wish to attain their desires could help identify those with good intentions, and those that are not. Also, immigrants should sign a bond of good behaviour throughout their stay in the community, and should agree to abide by the rules and regulations of the community.

The committee in-charge of mining should allocate part of the royalties to uplift education in the community. Needy students should be assisted by catering for their fees and other charges in school in order to reduce the burdens of their poor parents, and also to keep them in school even when those charges are not paid.

6.2.2 Environmental dimension

The mining committee should also make sure that, vegetation of exhausted sites are properly and fully recovered by refilling all the pits and replanting trees to in those areas. This could contribute to recovering the fertility and vegetation of farmlands and forest that are lost to mining and gravelling activities.

6.2.3 Economic dimension

To help reduce poverty in the community especially among the underprivileged, the mining committee should allocate part of the royalties paid by miners to assist those who are under privileged. This could be done by paying them a particular amount of cash depending on situation they (underprivileged) fine themselves, such as the sick, disabled, unemployed and old aged. This could resource them enough to cope with the escalating high prices of goods and services.

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APPENDICES

1. Interview Guide and Questions for Data Collection

1.1 Interview Guide for Households in Banda Nkwanta

This guide seeks to acquire household data before and after the establishment of the mines. Most of the questions would be repeated for the cases of the two specific periods, (then and now).

1. Number of people in households. (Then and Now)
2. Number of years the household existed in the community.
3. Main source of livelihood (income) of the household. (Then and Now)
4. The total income level of the household per month. (Then and Now)
5. Living conditions of households. (Health, shelter, food, security, education). (Then and Now)
6. Influences of the living conditions of households. (Then and Now)
7. Possible ways to help improve current living conditions.
8. Household view about the impacts of mining activity in the community on employment, income levels, health, education, security and population.
9. Direct and indirect benefits of favourable impacts of mining activities on household.
10. Direct and indirect adverse effects of unfavourable impacts of mining activities on household.

1.2 Interview Guide for Focus Group Discussion

This guide seeks to acquire information about the community with respect to the mining activities and non-mining activities. This guide is targeted on group of people of the same occupation or profession who spent most of their lives in the community. Eg miners, farmers, traders, etc.

1. Could you please tell me what you know about the state of community before the establishment of the mining activity? With regards to:
 - i. Employment
 - ii. Income levels

- iii. Health status
 - iv. Education
 - v. Security
 - vi. Infrastructure
 - vii. Shelter
 - viii. Infrastructure
 - ix. Environmental status
2. What are the social vices that existed before the establishment of the mining activity?
 3. If any, to what extent has these vices affected the community?
 4. What is the current state of the community as a result of influence of the mining activity? With regards to:
 - i. Employment
 - ii. Income levels
 - iii. Health status
 - iv. Education
 - v. Security
 - vi. Infrastructure
 - vii. Shelter
 - viii. Infrastructure
 - ix. Environmental status
 5. Identify the social vices that arise and/or worsen as a result of the establishment of the mining activity.
 6. Has the population of the community increased since the establishment of the mining activity? If yes, how?
 7. Are the changes in poverty levels and living standards of people in the community been realized as a result of the mining operations?
 8. What are the problems affecting the community as a result of the mining operations?
 9. How is the community coping or dealing with these problems, if any?
 10. Have there been interventions of government and/or NGOs to help deal with those problems? If yes, is it adequate?
 11. What are the positive impacts of the mining activity on the community?
 12. If any, what are the measures put in place to enhance or improve these impacts?

13. Who are those responsible for the mining operation in the community?

1.3 Guide for Participants Observation

This would guide the researcher to acquire useful information by himself through personal observation.

1. Social life of the people in the community both day and night.
2. Steps and procedures involved in mining activities in the community.
3. Environmental damages in the community with respect to land, noise, air, water and forest.
4. Infrastructure development in the community (public and private).
5. Business and enterprise development in the community.
6. Health and sanitation conditions in the community.
7. Community initiatives to deal with negative impacts and enhance positive impacts of mining.

1.4 Interview Guide for Health Sector

This guide would assist in acquiring detailed information on the health status of the community. Target respondents include health personnel and herbalists within the community.

1. What are the major sicknesses identified in the community? Which one is the most dominant?
2. What are the causes of such sicknesses?
3. Which group of people are mostly affected by those sicknesses?
4. Are there any sicknesses or health related issues that are directly or indirectly caused by the mining operations?
5. How are the facilities or personnel dealing with these health problems?
6. Have the sector received aids to help improve the health services for the community? If yes, who?
7. What are the possible measures that could help control these health problems?
8. Who do you think would be responsible for implementing such measures?

1.5 Interview Guide for Educational Sector

This guide is to assist in acquiring information on education and literacy in the community. Target respondents are staffs of schools and district education office.

1. Could you please tell a brief history about education in the community?
2. According to your records, how many people have ever been enrolled in the school(s)?
3. How many people have pass through successfully?
4. What are the reasons that prevented the others from passing through?
5. What is the general attitude of people towards education?
6. What are the challenges the community is facing towards education?
7. What are the impacts of the mining operation towards education?
8. Have there been interventions from the government and/or any external aid towards improving education and literacy in the community?
9. What could be the possible measures to improve education and increase literacy rate in the community?

2. Interview Schedule

Table 5. Schedule for personal interviews

SN	Respondent	Job/Occupation	Language	Date	Duration
1	Male	Headteacher of Banda Nkwanta E/A J.H.S	English	26/07/2016	11 minutes
2	Male	Acting Headteacher of Banda Nkwanta E/A Primary	English	26/07/2016	10 minutes
3	Male	Dawah Islamic School	English	26/07/2016	16 minutes
4	Male	Mine Operator (Sump boy)	English and Waali	26/07/2016	30 minutes
5	Female	Health Practitioner	English	26/07/2016	10 minutes
6	Male	Mines Operator (Sponsor)	English	27/09/2016	15 minutes
7	Households (8)		Waali	27/07/2016	15 minutes each
8	Households (12)		waali	28/09/2016	15 minutes each

3. Focus Group Discussion Schedule

Table 6. Schedule for focus group discussions

SN	Respondent	Job/Occupation	Language	Date	Duration
1	Boys	Students	waali	25/07/2016 (night)	20 minutes
2	Staff	Darru Salam Islamic School	English	26/07/2016	14 minutes
3	Women	Petty Traders	waali	27/07/2016	17 minutes
4	Men	Mines Operators	waali	28/07/2016	20 minutes

4. Research Pictures at the Field

I.



Figure 7. Full view of mining site (Part 3). (Taken on: 27/07/2016)

II.



Figure 8. Deforested zone for future pits. (Taken on: 27/07/2016)

III.



Figure 9. 50 meters deep pit. (Still in process to reach the crust). (Taken on: 27/07/2016)