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TOPIC

THE MANAGEMENT OF THE OPERATIONS OF SMALL-SCALE MINING INDUSTRIES IN THE OBUASI MUNICIPALITY.

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MASTER OF TECHNOLOGY EDUCATION (MECHANICAL TECHNOLOGY)

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A DISSERTATION IN THE DEPARTMENT OF TECHNOLOGY EDUCATION, FAULTY OF TECHNICAL EDUCATION, SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD OF THE MASTER OF TECHNOLOGY EDUCATION (MECHANICAL TECHNOLOGY) DEGREE.

AUGUST, 2013.

DECLARATION

CANDIDATE'S DECLARATION

I Alexander Adu Asamoah declare that this Dissertation, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE:…….

DATE:……

SUPERVISOR'S DECLARATION

I hereby declared that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Dissertation as laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: Mr. Stephen K. Amoakohene

SIGNATURE:……

DATE: ……

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DEDICATION

I dedicate this Dissertation to my beloved family; my wife Linda, my sons Kwame and Kwabena and my daughter Aso.

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ABBREVIATIONS

AIDS…….Acquired Immune Deficiency Syndrome

ANOVA….. ……Analysis of variance

ASM……..Artisanal

Cn……..Cyanide

EPA.....Environmental Protection Agency

GDP……...Gross Domestic Product

GHACHIFA…… .Ghana and China friendship Association

Hg……...Mercury

HIV ……...Human Immunodeficiency Virus

IIED……..…..International Institute for Environment and Development

ILO…….....International Labour Organization

PMMC…….Precious Mineral Marketing Company

PNDCL……...Provisional National Defense Council Law

SPSS……Statistical Package for Social Sciences

SSM……..…. Small-scale mining

UNEP……..United Nation Environmental Programme

ABSTRACT

Small-scale mining has become an activity that provides livelihoods to growing numbers of rural people in Ghana. This has attracted most of the youth and other groups of people into the business**.** This study sought to explore the management of operations of small-scale mining industries in the Obuasi Municipality. The study sought the views of small-scale miners from the communities under study (Ahansoyewodea, Pomposo, Akrokerri, Kwabrafoso, Asonkori and Akaporiso) at Obuasi Municipality. The instrument used to gather the data was questionnaire and interview. Simple random sampling technique was used to select the miners. Statistical Package for Social Sciences (SPSS) was employed for data analysis. The result of the study shows that 86.7% of the respondents experienced improvement in living conditions as a result of the business. All the respondents (100%) indicated that they don't receive any support from the government. More than half of the respondents (53.3%) have not received any education on the hazards of mining. Generally, this study has confirmed that the issue of the management of the activities borders on legislative instrument and policies implementation, public institutional failure, rural poverty, use of rudimentary tools, poor technology, and low level of education among the miners and the attitude of some miners.

CHAPTER ONE

INTRODUCTION

This chapter discusses the background of the study, statement of the problem, significance of the study, purpose of the study, research questions, scope and limitations, delimitation and organization of the study

1.1 Background of the Study

Small-scale mining (SSM) is an activity that is increasingly gaining momentum in many parts of the world. International Labour Organization estimates that 100 million people depends on small-scale mining and about 20 people are active small-scale miners for many countries. The small-scale mining of precious minerals has made a significant impact on the socio-economic lives of people and communities involved directly or indirectly in the sector (Kesse, 1985; Hilson 2002).

In Ghana, the precious minerals mine at the small-scale level is gold and diamonds. Ghana Mineral Commission (2004), argued that 'since the regularization of small-scale mining in1989, over 1.5 million troy ounces of gold and 8.0 million carats of diamonds have been purchased by the sector'.

Small-scale mining is largely practiced in rural areas by artisans who lack the requisite education, training, management skills and essential equipments. This is associated with a number of social and economic problems including diversion of livelihoods from more sustainable activities; squalid camp conditions, where substance abuse and sexual promiscuity create health risks; child labour; environmental damage and localized inflation. A number of

initiatives in recent year to formalize and regularize resident small-scale mining operations. Although these efforts have noticeably improved the efficiency of operations, certain problems- principally, environmental impacts and land use conflicts continue to be largely ignored by government and are becoming increasingly unmanageable. (Hilson, 2001).

In view of the poor financial base of small-miners, a great majority relies solely on traditional/manual methods of mining, which are largely artisanal, featuring simple equipment like shovels, pick-axes, pans, chisels and hammers. He categorized the methods as; shallow alluvial mining, deep alluvial mining and hard rock (lode) mining. Shallow alluvial mining techniques or dig and wash are used to mine shallow alluvial deposits usually found in valleys or low lying areas. Such deposits have depth not exceeding three meters vegetation are cleared and the soil excavated until the rich gold layer is reached. The mineralized material is removed and transported to a nearby stream for sluicing to recover the gold.(Aryee et al, 2003).

Deep alluvial techniques are used to mine deep alluvial deposits found along the banks of the major river such as Ankobra, Tano and Offin and certain older river courses. Hard rock mining techniques are adopted to mine gold bearing reefs, which can be located close to the surface or deep seated holes are sunk to intercept the reef and when accomplished, the reefs are weathered small- scale miners used chisel and hammers to break ore. In case where ore is hard, explosives are commonly used, deposits being prohibited throughout in Ghana .The most predominant mining operation in Ghana is surface mining taking about 75% of the mining activities in the country (Tsikata, 1997). Surface mining requires the acquisition of large tracks of land, the average of which is about 58 square miles (150squre kilometers), with a 30-year lease period.

The recent development of Chinese foreigners into the country whose main activity is to engage in legal or illegal small-scale mining has created chaos and misunderstanding between some community chiefs and the people living in these areas. It comes in the context of growing public agitation over the destructive, quite predatory, medium scale mining operations engage in mainly by the Chinese and some Indians. Again, the President of Ghana asserted that "the illegal miming phenomenon has cost the Country both human and capital resources with over 300 people dying last year,17 people have lost their lives so far this year". Most of the local communities have not benefited despite the large sums of money paid to some land and property owners. The activities have caused environmental and social problems that can have negative impact on future economic growth to the country. The present sturdy aims at contributing to this area the management of the operations of small-scale mining industries in the Obuasi Municipality.

1.2 Statement of the Problem

Small-scale mining brings several benefits to the developing countries, manifested mainly as employment and revenue. Most small-scale miners in Ghana are engaged in the extraction of gold and diamonds simply because they can generate wealth quickly. Small-scale mining in Ghana, as in most developing countries was for decades treated as an informal industrial sector, employing thousands of people but featuring largely rudimentary ,unmonitored an uncontrolled practices (Hilson,2001). Since most of the labourers in small scale mining are unskilled and semi-skilled, their only interest is getting the gold rather than the safety measures or working conditions needed to be taken to ensure efficient and less-risk environment in where they operate Again, most of the people engaged in small-scale mining have little or no educational

background. They are sometimes naïve about the consequences or problem that unsafe working practices and conditions in these areas could affect themselves as well as the people around and the environment at large.

Anglo Gold annual report (2006) states that "there are substantive legislation hurdles in many countries characterized by either a lack of regulation, ambiguous legislation or legal framework which is inappropriate to small-scale operators and, consequently, is not enforced.

In spite of numerous roles that small-scale (gold) mining industries are playing in the socio-economic development of the country, there are still some challenges militating against the operations of small-scale mining activities on our environment which hamper or prevent their operation from performing efficiently and effectively.

In view of this, the present study was undertaking to provide and contribute to ways of managing the operations of small-scale mining industries in Obuasi Municipality.

1.3 Significant of the Study

This study seeks to measure the extent to which the activities of small-scale mining industries contribute to the improvement of the lifestyle of the people living in and around the communities Again, the study seeks to explore the operational differences between the small-scale mining industries and the large scale mining industries. The study examines the kind of support do the small-scale industries receive from the government/mineral commissioners. This will enhance the government to re-define the operations of small-scale to make it more attractive for the unemployed youth and further dismisses the negative perception of the general public about the activities of these small-scale industries.

The study further determines the effect of education on the operational activities of small-scale industries particularly in gold mining sector. Feedback from the study will provide the policy makers with ideas and insight to strategize things for the needs of community development Finally, for researchers, this study will contribute to the scanty body of literature on managing the operational activities of small-scale mining industries in Obuasi and the rest of Ghanaian society at large.

1.4 Purpose of the Study

This study sought to explore the attitude of operational management of small-scale gold mining activities and the socio-economic and environmental effects of the mining communities in the Obuasi Municipality. The present study was;

- To assess the improvement of lives of the people living in and around the small-scale mining community.
- To find out the differences between the operations of small-scale mining industries and the large-scale ones.
- To assess the support the Government / Mineral Commission provide for these small-scale gold mining industries in Ghana.
- To identify the effect of educational level of the people involved in the operations of small-scale mining industries.

1.5 Research Questions

The following research questions guided the study:

- How do the small-scale mining industries help to improve the lifestyle of the people living in and around this community?
- How do the operations of the small-scale mining industries differ from that of large scale ones?
- How does the Government/Mineral Commission support the small-scale mining industries in Ghana ?
- How does educational level of the people involved affect the operations of the small-scale mining industries?

1.6. Limitations

The study is limited to unavailability of getting enough information on the environment and the social damage to the small-scale mining communities as a result of small-scale mining operations in the part. Also, due to lack of attention and co-operation form respondents, the total number of persons interviewed may be smaller than anticipated, and the quality of responses provided may not be adequate.

1.7 Delimitation of the Study

The topic under study combines both qualitative and quantitative data from the major stakeholders namely: government, traditional leaders, miners and individual people living in and around Obuasi Municipality. However, the study was narrowed down in scope due to financial and time constraints. It has therefore confirmed itself to only miners and other individuals living in and around Obuasi Municipality.

1.8 Organization of the Study

This report is comprised five chapters. Chapter one deals with the background of the study, the problem statement, significant of the study, purpose of the study, the research questions, limitation of the study, and delimitation of the study and the organization of the study.

Chapter two focuses on the review of related literature while the methodology of the study is the subject of chapter three. The chapter on the methodology describes the research design, the population sample and sampling procedures, data gathering instruments, data collection procedures of the study. Other aspects in the chapter are the variables of the study and the methods of data analysis. Chapter four presented the results obtained from the study area while chapter five discusses the results.

Finally, the summary of findings, conclusions, recommendations and suggestions for further research were also reported in chapter six. The table of content is having SIX (6) chapters while the organization of the study is having FIVE (5) chapters.

CHAPTER TWO

LITERATURE REVIEW

This chapter consists of the various literatures about the small-scale mining issues in the country, African, and the rest of the world. It is believed that, the information provided will help the readers to have a broader view on the topic under review. The review will be done on the following:

- Socio-Economic issues of small-scale gold mining in Ghana.
  - Employment opportunities
  - Urbanization
- Method of operation of small-scale mining
  - Effects of Education.
  - Hazards and health risks in small-scale mining.
- Policy framework**.**

2.1 Socio-Economic issues of small-scale mining industries in Ghana

Ghana is blessed with mineral resources; as a result, mining constitute the greater part of the national economy. The Government of Ghana realised the contribution made by the mining sector to the economic development, in terms of income generation, employment creation, and export earnings. The mining industry of Ghana accounts for 5% of the Country's Gross Domestic Product (GDP) and minerals make up 37% of total exports of which gold contributes over 90% of the total mineral export. After independence, the Ministry of Mines and Energy was created to ensure that government can exercise a regulatory and facilitating role, combining in one portfolio all relevant administrative function (Murray, 1993: 53). The main reason behind

this was to enable the mining sector to contribute to national goals. “In Ghana mining is regulated by various laws, of which the Minerals and mining Law of 1986 (PNDC Law153), as amended in 1994 and 2005. The small-scale mining Law 1989 plays a major role”…)

People who lack information and necessary resources to be able to possess the affordable equipments and methods that reduce environmental impacts mostly practice small-scale mining. As a result the damage they cause to the environment outweighs the output of their production (Angula 2007).

2.1.1 Employment Opportunities

Small-scale mining and mining in general has the potential to provide the nation with employment opportunities which in effect reduces the high unemployment rate in some rural areas and the nation at large. Most small-scale miners in Ghana are engaged in the extraction of gold and diamond simply because they can generate wealth quickly. (Hilson G. 2003).

Again, growth in the ASM sectors has the potential to provide a quick route to riches and, more realistically, a means of ensuring daily sustenance. Obuasi has no factories whereby people could be gainfully employed. In actual sense there is a considerable unemployment in Obuasi especially youth unemployment creating a social challenge.

Artisanal and small-scale mining employs 10 times more people than large-scale mining, providing jobs and income for 20-30 million of the world's poorest people and supporting the livelihoods of five times that number. In South Africa, for example, it is a means of livelihood for about 10,000 people, and as many as 12 million people in India, most of whom lack technological expertise and are largely unaware of the health and safety risks involved in mining by International Institute for Environment and Development.(Malhotra, 2013).

2.1.2 Urbanization

Urbanization is the physical growth of urban areas as a result of rural migration and even sub urban concentration into cities particularly the very large ones (http://www.en. Wikipedia.org/wi ki/urbanization). As more and more people leave villages and cities into these mining areas urban growth results this leads to increase in population of Obuasi Municipality. Those who come there have their own reasons for being there, some come to mine for the gold with the machines they have locally produced, others come to trade in the gold, by this they buy the gold and sell to people elsewhere. Other traders come with their wares to sell to the miners and sell at high prices. Some of these people finally settle there and make family. They acquire lands and build houses and contribute to populace the town. For instance, there had been a number of new settlements within some few years of intensive small-scale mining in Obuasi Municipality. Suburbs like Ahansoyewodea, Pomposo, Asonkori, Akaporiso, Konka new sites and others had experienced such as tremendous growth.

2.2 Method of operation of small–scale mining

Small-scale mining which normally operate on the surface involves clearing of the environment in order to get access to the mineral resources. Therefore, in some cases environmental challenges can be associated with the size of the operation or the area in which mining is taking place. The air is polluted by noise coming from the movements of vehicles and machinery, smoke and fumes and dust formation.

People who lack information and necessary resources to be able to possess the affordable equipments and methods that reduce environmental impacts mostly practice small-scale mining. As a result the damage they cause to the environment outweighs the output of their production (Angula 2007).

Aryee et al (2003**),** explain the mining methods employed by small-scale miners; in view of the poor financial base of small-miners, a great majority relies solely on traditional/manual methods of mining, which are largely artisanal, featuring simple equipment like shovels, pick-axes, pans, chisels and hammers.

This is mostly due to the fact that small-scale and artisan miners in some countries operate outside the legal and regulatory framework. Small-scale miners tend to focus on immediate consequences than the long term ones (large scale mining). Their main focuses are on the extracting minerals for survival purposes

2.2.1 Effect of Education

People with low educational background and school dropout who might have been a burden to the society can find their feet in the small-scale industries. These people may have little or no skills or knowledge in the operation but due to their hard labour in helping to extract the gold to earn a living. In a technical paper published by World Bank, entitled strategy for African mining, it is estimated that some 30,000 people are employed within the legalized segment of the Ghanaian small-scale mining sector.

To add to this, Amankwah and Sackey (2005), opine that mining operations are useful in basic skills development and contribute to the transformation of unskilled labour into semi-skilled and skilled workers. More importantly, due to the low barriers to entry in terms of capital needs, formal educational requirements, small-scale mining operations offer excellent opportunities for the evolution of indigenous entrepreneurs. In rural areas where other jobs are low paying or non-existent, small-scale mining appears as a valuable source of employment. The small-scale sector done employs about one millions youth in Ghana. (Issah A., 2013)

The adverse effects of small-scale mining to the environment which is contamination of water due to improper disposal of waste from mines, erosion in the mining sites, mercury and cyanide poisoning siltation and pollution of water bodies due to small-scale mining affect drinking water.

The International Labour Organisation (ILO) noted in a recent resolution that the lack of resources, skills and knowledge meant that many small-scale mining operations suffered from low productivity, inadequate incomes and poor safety and working conditions. The resolution called on member states of the ILO and on employers' and workers' organisations to take a range of measures that would enable small-scale miners to work more productively, more safely and with less of a negative environmental impact.

Heemskerk (2002), "reported small-scale miners themselves explained their occupational choice by the lack of other jobs that earned sufficient income to sustain a family, and their limited formal education"

2.2.2 Hazards and Health Risks at Small-Scale Mining

People living in mining areas are emotionally and physically demanding. Most small-scale miners live in mining camps that are located away from their homes. Their working methods and environment expose them to chemical contaminants, heat stress, ergonomic problems, unsafe equipment and mine structures, unsanitary conditions, malaria, and alcohol consumption further decrease the body's natural resistance mechanism to disease (Walle and Jennings 2001).

There is also "difficulty in acquiring registration and permit, excessive demands and harassment from chiefs, communities and security services, threats of armed robbery, lack of financial assistance from banking institutions and lack of standardization of compensation. (Issah, 2013).

Hentschel et al,(2002),states that "many small-scale mining operations are said to be lacking the following –safety regulations, reinforcement of mine safety requirements awareness of the risks

inherent in mining, and access to better equipment. "Dust and gaseous fumes of chemicals like mercury and others exposes into the environment during the operations of small-scale mining poses danger to the mine workers and the people living and around these areas (Hentschel, 2002). This happens because the burning of amalgam and mercury is done in poorly ventilated areas and others in openly spaces. Aryee et al (2003), explains that "small-scale mining operations that involves size reduction of ore generate some dust that could be hazardous to human health since the particles generated from such sources fall within the respirable dust range and are capable of causing dust related diseases".

Kessey and Arko (2013) argued that "the gold-mercury amalgam takes place by heating a sauce pan with a lid. Although this is an improved process, the miners finally throw the mercury residue, in the sauce pan, on the ground allowing it to escape into the atmosphere, soil and rivers".

Mercury contamination in water system disrupts the aquatic ecosystem and then eventually affects humans (Veiga et al, 2006). The two important chemicals used in mining are mercury (Hg) and cyanide (Cn). Cyanide is also poisonous to both domestic and wild animals (Shoko, 2002).

In the study of Babut et al (2003) in Ghana, it was argued, that "high concentrations of mercury were found in the sediments and fishes collected in the rivers close to mining sites.

Social problems such as crime, increased in levels of substance abuse as well as prostitution and high exposure to HIV/AIDS are common. (Anglogold Ashanti Annual Report, 2006)

2.3 Policy Framework

The legal framework for registration of small-scale gold and diamond mines, mineral production and sales in the sector was established in Ghana in 1989. The Small-scale mining law, PNDCL 218 (Anon, 1989a) led to the establishment of the Small-scale Mining Project within the Ghana Minerals Commission. The Small-Scale Mining Project (now small-scale Mining Department) has the responsibility of providing technical assistance to prospective and registered small-scale miners in Ghana and promoting their activities. The Mercury Law, PNDCL 217 (Anon, 1989b). The PMMC operates gold and diamond purchasing offices in Accra, Tarkwa and Bolgatanga and has licensed buying agents and sub-agents throughout mining areas in the country who buy gold and diamonds for resale to the corporation. (Amankwah and Sackey 2004).

The operations of ASM and SSM in the country in recent times is a big heddle to the government of today, This was as a result of many influx of Chinese nationals flooding the country to engage in small-scale mining with / without permit or license. The assistant manager for Mineral Commission, Peter Awuah told the "DAILY GUIDE" News paper on 23rd August, 2012 that "the commission had a strong conviction that the illegal Chinese miners were in an unholy alliance with certain indigenes who might be possessing small-scale mining licenses. These licenses may have been passed on to the Chinese". Again,Ivan Sui a Chinese investment banker, disclosed to DAILY GUIDE at the 51st anniversary of the treaty of friendship between Ghana and China (GHACHIFA),that most of the Chinese nationals flooding the country to engage in mining are semi –literate who were not well educated on the rules and regulations governing mining in Ghana."

Inusah Fusani Minister designate for lands and natural resources emphasized that "it is important for us to embark on a vigorous information and education campaign to assure all Ghanaian who want to engage in small-scale mining that there is opportunity for them to do so within the laws of the country". He then continues to say that "the system of registration is less cumbersome for citizens who want to undertake the venture so they successfully do the small-scale mining legally". He further stated that for example "subject subsections (1) and (2) of section 75 of the Mineral Law, 1986 (PNDC153) and amended ACT 2006 Act 703), no license for small-scale gold mining operation shall be granted to any person who is not a citizen of Ghana". These call for the government and other stakeholders to remove the bottlenecks in the process of securing and acquiring work permit and license to enhance smooth operation in this sector for socio-economic development of the country. There are substantive hurdles in many countries characterized by either lack of regulations, ambiguous legislation or a legal framework which is inappropriate to small–scale operators and consequently, is not enforced. (Anglogold Annual Report, 2006).

Ashanti Regional Director of the Environmental Protection Agency (EPA), Isaac Owusu, called for decentralization of the system involved in issuing permit to miners, stressing that the current state whereby all documents are processed in Accra does not augur well for the smooth operations of the small-scale mining in the country (Issah, 2013).

CHAPTER THREE

METHODOLOGY

This chapter discusses the methodology used to for study. It deals with population used in the study ,the research design, the sampling and sampling technique, data collection technique, data collection instrument and data analysis.

The method that was used in this study was both qualitative and quantitative in nature.

The study was based on both field visit and secondary data analysis

3.1 Research Design

The research design employed for this study was that of survey which relied on questionnaires and interview to produce data.

Dillman (1978) as cited by Amedahe (2002) recommends the use of survey research design to draw inferences about the characteristics, attributes or behaviour of population for the purpose of generalization for a sample of population. This design is to identify the practices of the small-scale mining industries through administering questionnaire. The data generated were analyzed quantitatively by statistical method.

3.2 Population

In Ghana there are about 300 registered small-scale mining groups and they contribute a major source of employment especially for small-scale gold and diamond miners and contribute some foreign exchange to Ghana's economy.

However there are a lot more of such groups that are not registered, and cannot access any meaningful form of support to boost their businesses. The population covered reflected people such as example gender, age, and ethnic group.

3.3 Sample and Sampling procedure

The samples for the study were made up of one hundred and eighty (180) small-scale miners who were selected through random selection were given questionnaires and interviewed. The return rate comprises of one hundred and five men (105) small-scale miners and forty five women (45) small-scale miners.

Based on the information obtained Statistical Package for Social Sciences (SPSS) was the analysis tool used. Random sampling was employed to receive the information. The reason behind random sampling was to enable every small-scale miner to stand a chance of being interviewed. The random sampling method could also avoid bias in the research sample. The miners that formed a sample population were interviewed and the results was generalised to the entire small-scale mining industries in the Obuasi community. The interview was preferred, as it enabled the miners to give as much information as possible.

3.4 Instruments for Data Collection

Semi-structured interviews and self administered questionnaires were employed in this study. The semi-structured interviews provide the interviewers insight into how the interviewees see the social world and how they understand the different issues. In this study the aim of the interviews was to understand better how the actors perceive the management of operations of small-scale mining and factors that they consider important to take into account in order that small- scale mining sector contributes to sustainable development.

Again, Purposive sampling was used to choose the responders that could contribute to answer the research question of this study. Responders were identified according to their responsibilities in the government, mining companies or civil society organisations which could represent the different groups of actors.

The study was undertaken on Obuasi mining community Ahansoyewodea, Pomposo, Akrokerri, Kwabrafoso, Asonkori and Akaporiso at micro-level but scaled up with secondary information from the community to Municipal levels to address the micro-and macro- aspect of the assessment. It consisted of desk study and primary data collection. The desk study consisted of a literature review of existing reports and works i.e. previous studies relating to the subject matter, at the community, district, regional and national level in other African countries and the world. The primary data collection involved visits to selected communities in the Obuasi Municipal to assess the social structure of the communities as well as the environmental aspects of small-scale mining in the communities. The aim was to pave the way for active involvement of the communities. The field visits also included the identification of stakeholders-communities impacted by small-scale mining, government support agencies for the sector, non-governmental organisation and community-based organisations to solicit their effective participation. The

participatory methodology was achieved through focus group discussions alongside with informal interviews with 30 residents (5 each) from six small-scale mining areas.

Three assemblymen and two opinion leaders were also interviewed to ascertain the communities' involvement in decision making with regards to small scale-mining activities. Also, for the self-administered questionnaire was used (appendix A).

The questionnaire sought to measure the management of the operations of small-scale mining. One hundred and fifty (150), small-scale miners were targeted for the study. The instrument had a number of features that are described as follows: The questionnaire contained forty five (45) items. They are mixture of dichotomous type, multiple choice items and sometimes supply type of items. The first part of the questionnaire sought socio-demographic information such as age, gender, area of residence, main occupation and educational level.

The second part of the questionnaire elicited information on the improvement of living conditions of miners, which were dichotomously scored .Yes [ ] and No [ ]. The 'Yes 'was numbered as 1 and the 'No' was also numbered as 2.

The third part of the questionnaire focused on the method of operations in the small–scale mining. The responses were also dichotomously scored (1. 'Yes' [ ], 2.No [ ]), and multiple choice answers were also provided and others are left blank to seek for their view (supplied).

The fourth part of the questionnaire sought to determine the support the government provides to the small–scale mining industries. The responses were again, dichotomously scored (1.Yes [ ], 2. No [ ]), multiple choice responses, and supply responses were scored.

The fifth part of the questionnaire checked the effect of education on the small–scale mining .the response were dichotomously scored Yes [ ] and No [ ] The 'Yes' was numbered as 1 and the No was also numbered as 2. Multiply choice response and supplied responses were also provided.

3.5 Data Collection Procedure

The procedures used in data collection are outline below:

3.5.1 Pilot Study

The main study was followed by a pilot study in September 2013 using ten teachers who were in the field .These were randomly selected to complete the questionnaire .The main objective of the pilot study was to improve upon the items of the pilot questionnaire ,which also had four main sections as the final questionnaire namely ; improvement of living conditions of the people in small scale mining, the method of operation s of small scale mining, the support the government provide to the small-scale mining, and the effect of education on small -scale mining .

In view of this, the head of department and EPA officer were asked to comment on relevance of the items in relation to the problem of the study and check for spelling and grammatical errors. The teachers who took part in the pilot study were provided space to comment on ambiguities, underline words which were not clear and make other suggestions or comments.

Corrections and improvement were made on the suggestions and comments from those who took part in the pilot study.

The telephone numbers of the participants were collected and used to later call them for questionnaires.

3.5.2 Administration of the instrument

Five weeks were used to administer the questionnaires. The questionnaires were given to the respondents through personal visit to their work places. After gaining access to the respondents, the instrument was given out and most of them were guided to complete them. The questionnaires were read, explained and translated before responded to them. Others were able to respond without any difficult. The instrument was later collected.

3.6 Data Analysis

The data collected were grouped under sub-headings in which the questionnaires were structured. The data and responses were analyzed using Statistical Package for Social Sciences (SPSS) to determine the relationship between the variables. These included simple percentages descriptive statistics, t-test, chi-square and analysis of variance (ANOVA).

CHAPTER FOUR

RESULTS OF THE STUDY

This chapter consists of background analysis of data collected from the various communities under study (Ahansoyewodea,Pomposo,Akrokerri, Kwabrafoso, Asonkori and Akaporiso) at Obuasi Municipal.

4.1 Data Analysis

Although 180 potential respondents agreed to participate in the answering the questionnaires but the response rates of males and females small-scale miners turned out to be 75 percent (105) and 25 percent (45) respectively. This is not surprising as some small-scale miners are usually suspicious of visitors by virtue of the fact that most of them operate in secret places.

Table 4.1 Socio - Demography of respondents

	Gender			
Variables	**Male**	**Female**	**Total**	**Chi-square (p-value)**
Community				
Ahansoyewodea	10 (9.5%)	15 (33.3%)	25 (16.7%)	16.667 (0.005)
Pomposo	20 (19.0%)	5 (11.1%)	25 (16.7%)	
Akrokerri	20 (19.0%)	5 (11.1%)	25 (16.7%)	
Kwabrafoso	20 (19.0%)	5 (11.1%)	25 (16.7%)	
Asonkori	15 (14.3%)	10 (22.2%)	25 (16.7%)	
Akaporiso	20 (19.0%)	5 (11.1%)	25 (16.7%)	
Total	**105 (75.0%)**	**45 (25.0%)**	**150 (100.0%)**	
Age group				
0 – 20 years	9.5%	.0%	6.7%	55.159 (0.001)
21 – 30 years	42.9%	33.3%	40.0%	
31 – 40 years	42.9%	11.1%	33.3%	
41 – 50 years	4.8%	55.6%	20.0%	
Level of Education				
Junior High School	9.5%	11.1%	10%	24.339 (0.001)
Middle School	23.8%	44.4%	30%	

Senior High	38.1%	11.1%	30%
Technical/Vocational	28.6%	22.2%	26.7%
University	.0%	11.1%	3.3%

Table 4.1 showing the socio-demographic characteristics of the respondents shows that 25 respondents representing 16.7% each were drawn from 6 communities, namely Ahansoyewodea, Pomposo, , Akrokerri, Kwabrafoso, Asonkori and Akaporiso. Further analysis shows that there were a total of 45 females representing 25% of the total respondents whereas 105 representing 75% being males. A chi-square analysis of the results showed that there was a significant association between the responses given by the respondents on regarding their communities and their gender (Pearson's Chi-square=16.667, $p < .05$)

Furthermore, from Table 4.1 again, it could be seen that majority of the respondents 40% were aged from 21 – 30 years whereas approximately 33% were aged from 31 - 40 years. A further disaggregation of the results by the gender of the respondents showed a significant association between the ages of the respondents and their gender (Pearson's Chi-square=55.159, $p < .05$).

Again, Table 4.1 also presents the level of education of the respondents. The results show that majority of the respondents 30% for each was Middle School and Senior High School leavers. Again, chi-square analysis $\chi 2=11.538$, p-value=.042) showed a significant association between the level of education of the respondents and their gender.

4.1.1 Employment opportunity

1. How do the small-scale mining industries help to improve the lifestyle of the people living in and around the community?

Table 4.2 Does the activity improve living condition * community/T Crosstabulation

$\chi 2$=11.538, p-value=.042

	Community						
	Ahan	**Pom**	**Akro**	**Kwab**	**Asonk**	**Akap**	**Total**
Yes	20	20	20	20	25	25	130
	80.0%	80.0%	80.0%	80.0%	100.0%	100.0%	86.7%
No	5	5	5	5	0	0	20
	20.0%	20.0%	20.0%	20.0%	.0%	.0%	13.3%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

Ahan =Ahansoyewodea, Pom =Pomposo, Akro=Akrokerri, Kwab=Kwabrafoso, Asonk=Asonkori, Akap=Akaporiso

From Table 4.2 above, the respondents were asked to indicate whether the small-scale mining activities have improved their living conditions. The results shows that more than two-thirds of the respondents (n=130, 86.7%) reported 'Yes' to experiencing improved living conditions as a result of the small-scale mining activities. However, 20 respondents representing 13.3% reported 'No' to experiencing improved living conditions as a result of the small-scale

mining activities. Chi-square analysis of the results ($\chi 2$=11.538, p-value <.05) showed a statistically significant association between the responses given by the respondents and their communities.

Table 4.3 What are the benefits to you * community Crosstabulation $\chi 2$=7.502, p-value=.677

	Community						**Total**
	Ahan	**Pom**	**Akro**	**Kwab**	**Asonk**	**Akap**	
Income	18	16	18	16	13	14	95
	72.0%	64.0%	72.0%	64.0%	52.0%	56.0%	63.3%
Able to care for my family	6	5	5	8	10	9	43
	24.0%	20.0%	20.0%	32.0%	40.0%	36.0%	28.7%
Able to pay my rent	1	4	2	1	2	2	12
	4.0%	16.0%	8.0%	4.0%	8.0%	8.0%	8.0%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

Ahan =Ahansoyewodea, Pom =Pomposo, Akro=Akrokerri, Kwab=Kwabrafoso, Asonk=Asonkori, Akap=Akaporiso

Respondents were asked to point out the benefits they derive from the small-scale mining operations. Analysis of the responses showing in Table 4.3 above, indicates that nearly two-thirds of the respondents (n=95, 63.3%) reported of earning 'Income' whereas, 43 of the respondents representing 28.7% stated they are 'able to care for their families' as a result of the small-scale mining. Also, 12 respondents making up 8% are able to pay their rents as a result of the mining activities they are involved in. Again, Table 4.3 further presents the results in relation to the communities of the respondents and a chi-square analysis of the result shows that there is no significant association between the responses given by the respondents and their communities (Pearson's chi-square=7.502, p >.05)

The Figure indicates that the small-scale mining industry has high labour absorptive capacity for rural unemployed labour force.

Table 4.4 Do you have accommodation? * Community Crosstabulation $\chi 2=16.667$, p-value=.005

	Community						Total
	Ahan	**Pom**	**Akro**	**Kwab**	**Asonk**	**Akap**	
Yes	15	5	10	10	15	5	60
	60.0%	20.0%	40.0%	40.0%	60.0%	20.0%	40.0%
No	10	20	15	15	10	20	90
	40.0%	80.0%	60.0%	60.0%	40.0%	80.0%	60.0%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

Ahan =Ahansoyewodea, Pom =Pomposo, Akro=Akrokerri, Kwab=Kwabrafoso, Asonk=Asonkori, Akap=Akaporiso

From Table 4.4, more than half of the respondents (n=90, 60%) responded 'No' to having accommodation whereas 60 respondents representing 40% responded 'Yes' to having accommodation. The results is presented in relation to the community of the respondents and chi-square analysis of the results ($\chi 2=16.667$, p-value <.05) showed a significant association between the responses given by the respondents.

Table 4.5 if, no where do you live? * Community/T Crosstabulation $\chi 2=15.000$, p-value=.010

	Community						
	Ahansoyewodea	**Pomposo**	**Akrokerri**	**Kwabrafoso**	**Asonkori**	**Akaporiso**	**Total**
Rented house	15	10	5	5	10	5	50
	60.0%	40.0%	20.0%	20.0%	40.0%	20.0%	33.3%
family house	10	15	20	20	15	20	100
	40.0%	60.0%	80.0%	80.0%	60.0%	80.0%	66.7%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

From Table 4.5, it could be observed that more than half of the respondents (n=100, 66.7%) reported of living in their family house whereas, 50 respondents representing about 33% reported of staying in Rented houses. Again, Chi-square analysis of the result ($\chi 2=15.000$, p-value < .05) showed a statistically significant association between the responses given by the respondents and their community.

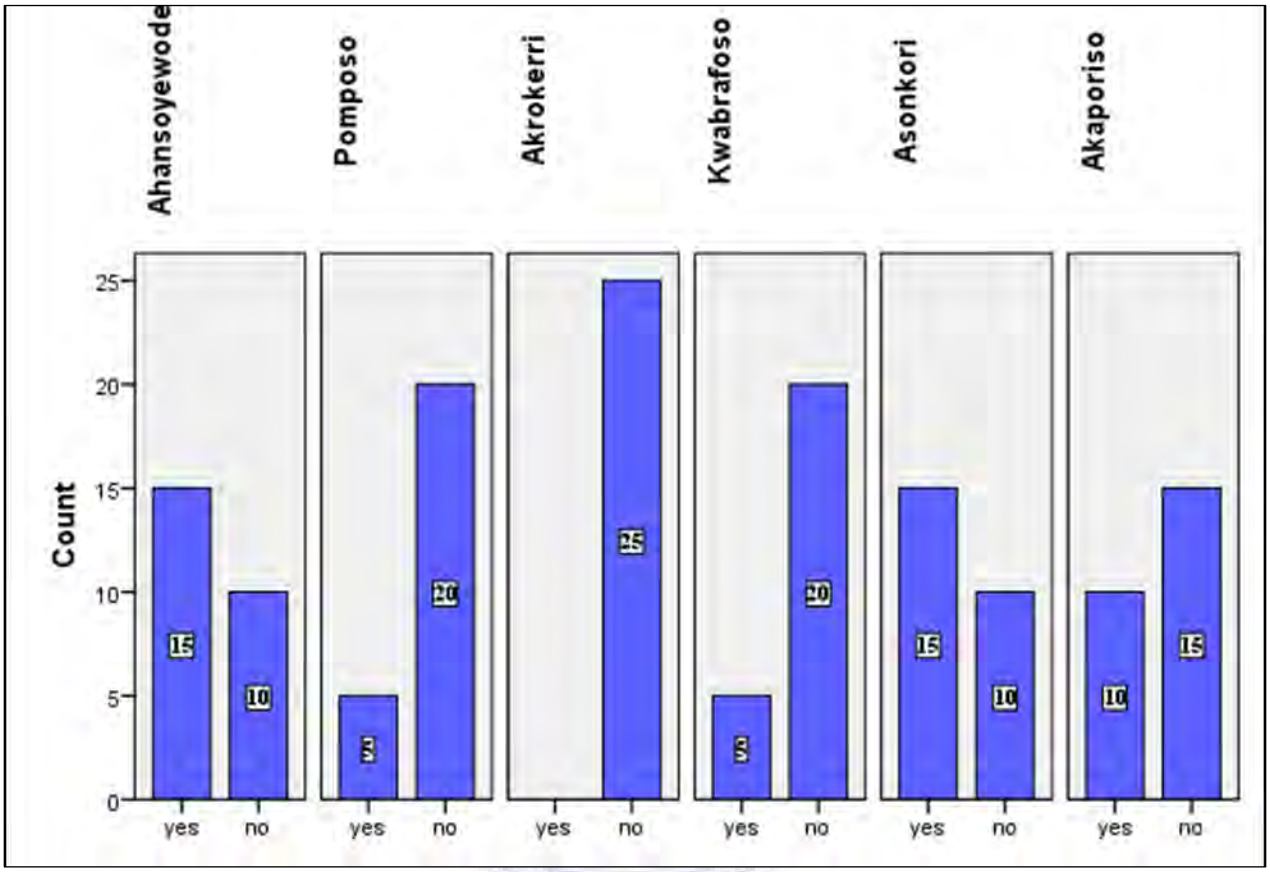

Figure 4.1 Do you have toilet facility in the house you live

In Figure 4.1 the respondents were asked to indicate whether they have toilet facilities in their houses. The results show the responses from the communities of residences of the respondents. From the Figure it could be observed that in Ahansoyewedea there were more responses for 'Yes' than 'No' suggesting that there are more houses in the community with toilet facilities than those without it. Again, in Pomposo there are more 'No' than 'Yes' implying that majority of the house in the community do not have toilet facilities. In Akrokerri all the respondents responded "No" signifying that almost all the houses in the community without toilet facility. More so, in

Kwabrafoso, there were more responses for "No" than "Yes" saying that majority of the houses in the community do not have toilet facilities. Again, in Asonkori there are more "Yes" than "No" reporting that there are more houses in the community with toilet facilities than those without it. Lastly, in Akaporiso there are more 'No' than 'Yes' implying that majority of the house in the community do not have toilet facilities

Table 4.6 What type of water * community/T $\chi 2=62.059$, p-value=.001

	Community						
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	Total
pipe borne water	20	20	10	15	5	15	85
	80.0%	80.0%	40.0%	60.0%	20.0%	60.0%	56.7%
Stream	5	0	0	0	0	0	5
	20.0%	.0%	.0%	.0%	.0%	.0%	3.3%
Well	0	5	15	10	20	10	60
	.0%	20.0%	60.0%	40.0%	80.0%	40.0%	40.0%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

Table 4.6 is a Cross tabulation of the result regarding the type of water available to the respondents in the various communities. The results shows that more than half of the respondents (n=85, 56.7%) have pipe borne water whereas 60 respondents representing 40% have wells.

Also, only 5 (3.3%) respondents reported of streams. A further disaggregation of the results shows that there is a significant association between the responses given by the respondents on the type of water and their communities (Pearson's chi-square=62.059, $p < .05$).

Table 4.7 how many times do you eat in a day? * Community Crosstabulation $\chi 2=51.714$, p-value=.001

	Community/T						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
One	5	0	0	0	0	0	5
	20.0%	.0%	.0%	.0%	.0%	.0%	3.3%
Two	15	5	15	10	20	10	75
	60.0%	20.0%	60.0%	40.0%	80.0%	40.0%	50.0%
Three	5	20	10	15	5	15	70
	20.0%	80.0%	40.0%	60.0%	20.0%	60.0%	46.7%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

Table 4.7, shows the number of times respondents eat in a given day. It could be observed that exactly half of the respondents (n=75, 50%) eat twice in a day, whereas, 70 respondents (46.7%) eat three times in a day. Chi-square analysis of the results ($\chi 2=51.714$, $p <.05$) showed a significant association between the number of times respondents eat and their communities of residences.

Table 4.8 Do you have any other business apart from this work? * Community Crosstabulation $\chi 2=52.262$, p-value=.001

	Community						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
Yes	0	10	10	10	25	10	65
	.0%	40.0%	40.0%	40.0%	100.0%	40.0%	43.3%
No	25	15	15	15	0	15	85
	100.0%	60.0%	60.0%	60.0%	.0%	60.0%	56.7%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

In Table 4.8, the respondents were asked whether they have any other business apart from the mining activities engaged in. Analysis of the responses shows that more than half of the respondents (n=85, 56.7%) reported 'No' to having some other business apart from what they are doing. However, 65 respondents representing 43.3% reported of having other businesses apart from the small-scale mining activities they are involved in. A further disaggregation of the results showed a statistically significant association between the responses given by the respondents and their community of residence (Pearson's Chi-square=52.262, $p<.05$).

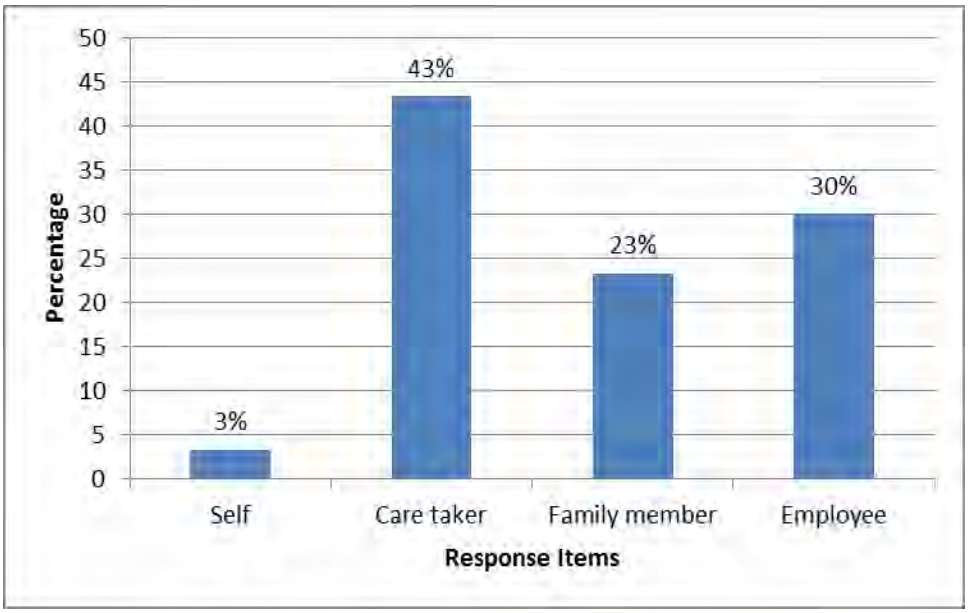

Figure 4.2 If yes, who manage this business?

Showing in Figure 4.2, respondents who reported of having other business were asked to indicate who manages the business for them. The results as shown in the Figure above indicates that majority of the respondents have left their businesses in the hands of Care takers 43% whereas 30% have employed people to manage their business. Meanwhile 23% reported that family members are taking care of their businesses. Only 3% of the respondents are managing it by themselves. Some of the small–scale miners disclosed in an interview that they have invested into other businesses as a result of the money they got from the mining and had employed other people to manage the business.

4.1.2 Method of operation small-scale mining

2. How do the operations of small scale mining industries differ from that of large scale ones?

Table 4.9 Is there any differences between the operations of small scale and large scale * Community Crosstabulation $\chi 2=27.019$, p-value=.001

	Community						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
Yes	20	20	10	20	25	20	115
	80.0%	80.0%	40.0%	80.0%	100.0%	80.0%	76.7%
No	5	5	15	5	0	5	35
	20.0%	20.0%	60.0%	20.0%	.0%	20.0%	23.3%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

In Table 4.9, it could be observed that more than two-thirds of the respondents (n=115, 76.7%) responded 'Yes' to acknowledging any differences between the operations of small-scale and large scale mining. However, 35 respondents representing 23.3% responded 'No' to any differences between the operations of small-scale and large scale mining. Chi-square analysis of the results ($\chi 2=27.019$, $p < .05$) showed a statistically significant association between the responses given by the respondents and their community of residences.

Table 4.10 What makes this differ? * Community Crosstabulation χ2=39.938, p-value=.001

	Community						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
Land size	4	4	4	5	2	1	20
	16.0%	16.0%	16.0%	20.0%	8.0%	4.0%	13.3%
Equipment used	17	5	8	10	23	15	78
	68.0%	20.0%	32.0%	40.0%	92.0%	60.0%	52.0%
Chemicals used	4	16	13	10	0	9	52
	16.0%	64.0%	52.0%	40.0%	.0%	36.0%	34.7%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

A follow up to Table 4.9, respondents were required to give their opinions on what accounts for the differences. The results showing in Table 4.10 depicts that more than half of the respondents (n=78, 52%) pointed at the Equipment Used, whereas 52 respondents representing 34.7% stated the use of chemicals. Meanwhile 20 respondents consisting 13.3% stated the land size. The results is further presented in relation to the community of residence of the respondents and chi-square analysis showed a statistically significant association between the responses given by the respondents (Pearson's chi-square=39.938, $p < .05$).

Table 4.11 What tools/equipment's do you use in your activities? * Community Cross tabulation

	Community						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
Locally made tools	25	25	25	25	25	25	150
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

The respondents were asked to state the tools or equipments they use in their activities. From Table 4.11, it could be seen that all the respondents (n=150, 100%) stated they use locally made tools in their activities.

Aryee et al (2003**),** explain the mining methods employed by small-scale miners; in view of the poor financial base of small-miners, a great majority relies solely on traditional/manual methods of mining, which are largely artisanal, featuring simple equipment like shovels, pick-axes, pans, chisels and hammer

Table 4.12 Where do you operate? * Community Crosstabulation χ2=1.107, p-value=.001

	Community						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
Surface	5	0	0	0	10	0	15
	20.0%	.0%	.0%	.0%	40.0%	.0%	10.0%
Underground	5	0	5	5	15	5	35
	20.0%	.0%	20.0%	20.0%	60.0%	20.0%	23.3%
River banks	15	5	5	5	0	5	35
	60.0%	20.0%	20.0%	20.0%	.0%	20.0%	23.3%
Forest	0	20	15	15	0	15	65
	.0%	80.0%	60.0%	60.0%	.0%	60.0%	43.3%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

From Table 4.12 above, more than 40% of the respondents (n=65) reported of operating in the Forest whereas 35 consisting 23.3% respondents operate in River banks. Also, 35 respondents representing 23.3% stated they operate underground. Only 15 respondents being 10% operate on the Surface. Again, the results is presented in relation with the community of residence of the respondents and chi-square analysis of the results shows a statistically significant association between the responses given by responses (Pearson's chi-square=1.107, $p < .05$).

Table 4.13 Have you attended any training concerning safe working * Community

Cross tabulation $\chi 2=38.000$, p-value=.001

	Community						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
Yes	10	15	20	15	0	15	75
	40.0%	60.0%	80.0%	60.0%	.0%	60.0%	50.0%
No	15	10	5	10	25	10	75
	60.0%	40.0%	20.0%	40.0%	100.0%	40.0%	50.0%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

In Table 4.13, exactly half of the respondents (n=75, 50%) have had training on safe working practices whereas the remaining half (n=75, 50%) reported of not having any training on safe working practices. Again, chi-square analysis of the results ($\chi 2=38.000$, $p < .05$) showed a statistically significant association between the responses given by the respondents based on their community of residences.

Table 4.14 Do you have any safety policy? * Community Crosstabulation $\chi 2=45.536$, p-value=.001

	Community						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
Yes	20	5	10	10	25	10	80
	80.0%	20.0%	40.0%	40.0%	100.0%	40.0%	53.3%
No	5	20	15	15	0	15	70
	20.0%	80.0%	60.0%	60.0%	.0%	60.0%	46.7%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

In relation to safety policy at work, the results as being shown in Table 4.14 above suggests that more than half of the respondents (n=80, 53.3%) reported 'Yes' to having policies on safety. However, 70 respondents representing 46.7% responded 'No' to having any safety policy at the workplace. The results are further presented in relation to the community of residence of the respondents and chi-square analysis ($\chi 2=45.536$, $p < .05$) shows a statistically significant association between the responses given by the respondents and their communities of residences.

Table 4.15 To whom do you report accidents to? * Community Cross tabulation $\chi 2=80.000$, p-value=.001

	Community						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
Chairman of small scale mining	15	0	5	0	0	0	20
	60.0%	.0%	20.0%	.0%	.0%	.0%	13.3%
Police	10	20	20	20	15	15	100
	40.0%	80.0%	80.0%	80.0%	60.0%	60.0%	66.7%
Other (specify)	0	5	0	5	10	10	30
	.0%	20.0%	.0%	20.0%	40.0%	40.0%	20.0%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

The respondents were asked to indicate whom they report accidents to. The results as being presented in Table 4.15 above shows that more than half of the respondents (n=100, 66.7%) report accidents to the Police whereas (n=30, 20%) report to other authorities. In addition, (n=20, 13.3%) report to the Chairman of the small-scale mining association. Again, Chi-square analysis of the results ($\chi 2=80.000$, $p < .05$) shows a statistically significant association between the responses given by the respondents based on the communities of residences of the respondents.

4.1.3 Support from Government/mineral commission

3. How does the government/minerals commission support the small-scale mining industries?

Table 4.16 Do you have license in operating this business? * Community Cross tabulation

	community/T						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
No	25	25	25	25	25	25	150
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

From Table 4.16, all the respondents (n=150, 100%) declared they do not have operating licenses for their businesses. Also the table presents the results in relation to the community of residence of the respondents.

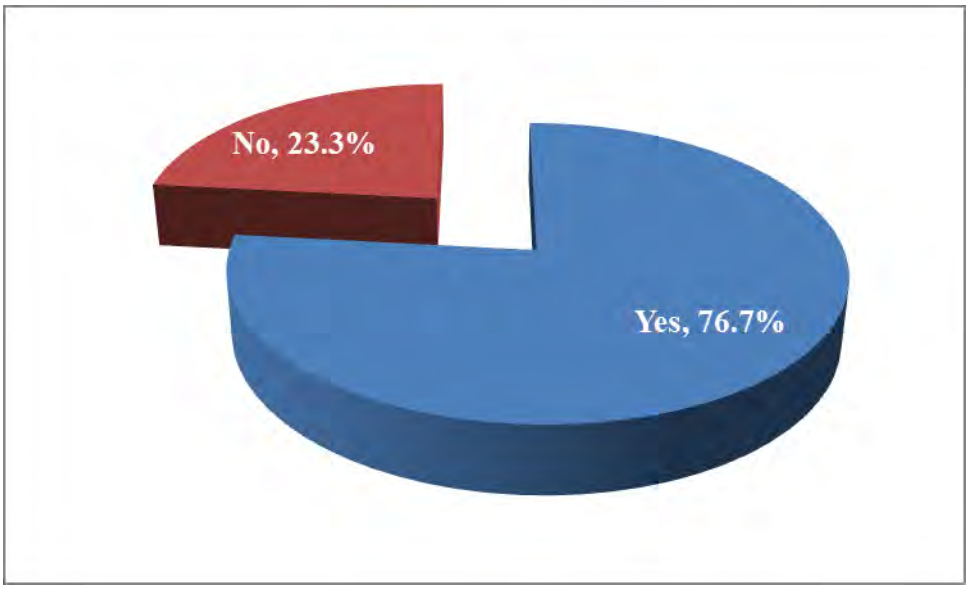

Figure 4.3 Is there any difficulty in securing the license for the business?

From Figure 4.3 above, approximately 77% of the respondents responded 'Yes' to experiencing difficulties in securing licenses for their business operations. However, about 23% of the respondents declared otherwise.

Table 4.17 Where can one secure this license? * Community $\chi 2=19.273$, p-value=.037

	Community						
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	**Total**
National capital	15	10	10	10	20	10	75
Accra	60.0%	40.0%	40.0%	40.0%	80.0%	40.0%	50.0%
regional capitals	10	10	10	10	5	10	55
	40.0%	40.0%	40.0%	40.0%	20.0%	40.0%	36.7%
municipal	0	5	5	5	0	5	20
assembly	.0%	20.0%	20.0%	20.0%	.0%	20.0%	13.3%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

From Table 4.17 above, it could be observed that exactly half of the respondents (n=75, 50%) stated the National Capital Accra is the place one can secure license for their operations. Again, 55 respondents representing 36.7% reported of the Regional Capitals whereas 20 respondents also constituting about 13% stated licenses could be ascertained from the Municipal Assembly. Again, chi-square analysis of the results ($\chi 2=19.273$, $p < .05$) produced a statistically

significant association between the responses given by the respondents based on their community of residences.

Table 4.18 Do you receive any grant or support from the government?

	Community						Total
	Ahansoyewodea	Pomposo	Akrokerri	Kwabrafoso	Asonkori	Akaporiso	
No	25	25	25	25	25	25	150
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total	25	25	25	25	25	25	150
	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%

Table 4.18 shows that none of the respondents receive any support from the government as declared by all the respondents (n=150, 100%).

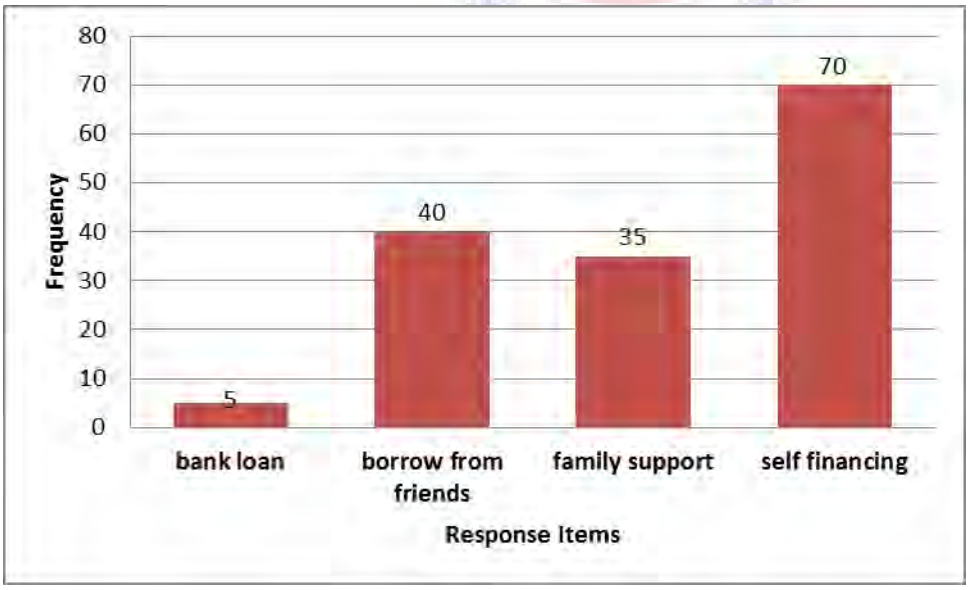

Figure 4.4 If no, where do you receive financial support?

In Figure 4.4 respondents who responded 'No' to receiving support from the government was asked to suggest where they get their financial support from. The Figure portrays that more nearly half of the respondents (n=70) are self-financing their businesses whereas 40 respondents borrow from friends. In addition, 35 respondents resort to family support and only 5 respondents take bank loans.

Table 4.19 Who provide you with tools and equipment?

	Frequency	Percent
NGO	5	3.3
self-provider	145	96.7
Total	150	100.0

Table 4.19 indicates that almost all the respondents (n=145, 96.7%) self-provide their tools and equipment for their operations whereas 5 respondents representing 3.3% on the other hand receive their tools and equipment from NGO's.

Table 4.20 Is your business recognized by the Ghana Revenue Authority?

	Frequency	Percent
Yes	15	10.0
No	135	90.0
Total	150	100.0

From Table 4.20, it could be observed that most of the respondents' businesses (n=135, 90%) are not recognised by the Ghana Revenue Authority (GRA) whereas only 15 respondents representing 10% have their businesses recognised by the GRA.

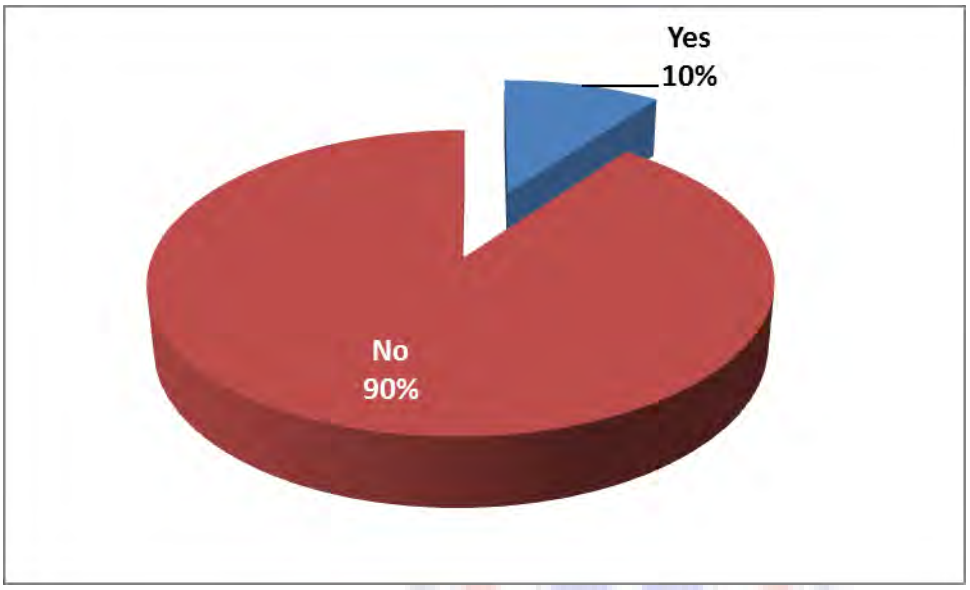

Figure 4.5 Do you pay income tax?

From Figure 4.5 above, majority of the respondents (90%) declared they do not pay taxes whiles only 10% pay their taxes.

In support of this, the Minister of Finance and Economic Planning, Dr. Kwabena Duffour,on 31 May 2011, stressed that the country has many self- employed professionals such as accountants, engineers, pharmacists, medical doctors, lawyers, bankers insurers, among others earning more than average income .However, the contributions to overall income tax revenue of many of these professionals, educated with the taxpayer's money has been very low (around five per cent) compared to other income tax payers.(Http://www.tighana.org/glipages/giinews.ph...)

Table 4.21 If yes, how often do you pay the income tax?

	Frequency	Percent
Three monthly	2	13.3
Six monthly	7	47.0
Yearly	6	40.0
Total	15	100.0

The fifteen respondents who pay their taxes were asked to indicate how often they honour their tax obligation and the results showing in Table 4.21 suggest that majority (n=7, 47%) pay taxes six monthly, whiles 6 (40%) pay yearly. Only 2 respondents (13.3%) pay three monthly.

Table 4.22 do you have rules and regulations that are guided by operational activity

	Frequency	**Percent**
Yes	123	82.0
No	27	18.0
Total	150	100.0

Regarding being guided by rules and regulations, more than two-thirds of the respondents (n=123, 82%) reported 'Yes' to having rules and regulations that guided their operational activities. However, 27 respondents representing 18% reported 'No' to having rules and regulations.

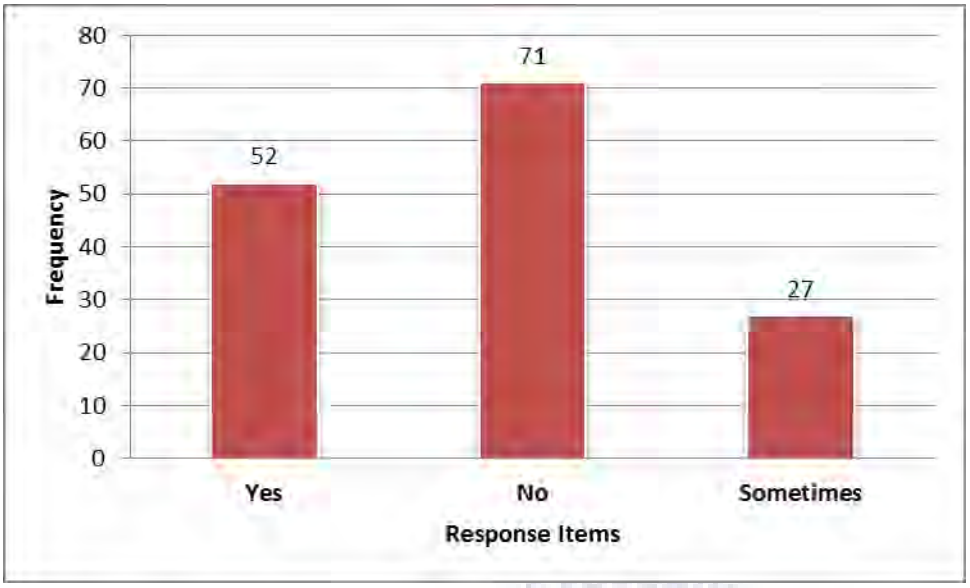

Figure 4.6 Do you comply with the rules and regulations governing mining?

In Figure 4.5, the results depicts that nearly half of the respondents (n=71) responded 'No' whereas, 52 respondents responded 'Yes' to complying with the rules and regulations governing mining. However, 27 respondents declared they sometimes comply with the rules and regulations.

Table 4.23 Is there any penalty for abusing the rule?

	Frequency	**Percent**
Yes	100	66.7
No	45	30.0
Sometime	5	3.3
Total	150	100.0

From Table 4.23, it could be observed that more than half of the respondents (n=100, 66.7%) responded 'Yes' to the effect that there is a penalty for abusing the rules and regulations guiding mining. However, 45 respondents representing 30% stated 'No'. Five respondents making up 3.3% on the other hand indicated that there is 'sometimes' a penalty for abusing the rules and regulations.

4.1.4 Effects of Education

4. How does the education level of the people involved affected by the operations of small-scale mining industries?

Table 4.24 for how long have you been in small-scale mining * educational level $\chi 2=2.659$, p-value=.001

	Educational level					Total
	junior secondary	middle school	senior high	technical/vocational	university	
6 months - 1 year	0	0	0	0	5	5
	.0%	.0%	.0%	.0%	100.0%	3.3%
1yr - 5 years	0	45	25	0	0	70
	.0%	100.0%	55.6%	.0%	.0%	46.7%
6 yrs - 10 years	10	0	20	25	0	55
	66.7%	.0%	44.4%	62.5%	.0%	36.7%
> 10 years	5	0	0	15	0	20
	33.3%	.0%	.0%	37.5%	.0%	13.3%
Total	15	45	45	40	5	150
	10.0%	30.0%	30.0%	26.7%	3.3%	100.0%

In Table 4.24, respondents were asked to indicate how long they have been in small scale mining. The results suggests that nearly half (n=70, 46.7%) have worked for 1 year to 5 years whereas 55 respondents representing 36.7% have worked for 6 years to 10 years. Again, 20 respondents consisting 13.3% have worked in small-scale mining for more than 10 years. The results are further presented in relation to the level of education of the respondents. Chi-square

analysis of the results suggest that there is a statistically significant association between the responses given by the respondents on how long they have worked in small-scale mining and their educational level (Pearson's chi-square=2.659, $p < .05$)

Table 4.25 Who taught you how to do Small-Scale Mining? * Educational level Cross tabulation χ2=1.020, p-value=.001

	Educational level					Total
	Junior high	Middle school	Senior high	Technical/vocational	University	
Relative	0	0	40	30	0	70
	.0%	.0%	88.9%	75.0%	.0%	46.7%
Friend	15	45	5	10	5	80
	100.0%	100.0%	11.1%	25.0%	100.0%	53.3%
Total	15	45	45	40	5	150
	10.0%	30.0%	30.0%	26.7%	3.3%	100.0%

From Table 4.25, the results shows that more than half of the respondents (n=80, 53.3%) learned how to do small-scale mining from their friends whereas 70 respondents being 46.7% were taught by their relatives. Chi-square analysis of the results (χ2=1.020, p < .05) produced a statistically significant association between the responses given by the respondents on who taught them how to do small-scale mining and their level of education.

Table 4.26 do you have manual or anything to guide your activities? * Educational level Cross tabulation χ2=50.000, p-value=.001

	Educational level					Total
	Junior Sec	middle school	senior high	technical/vocational	University	
Yes	0	25	20	0	5	50
	.0%	55.6%	44.4%	.0%	100.0%	33.3%
No	15	20	25	40	0	100
	100.0%	44.4%	55.6%	100.0%	.0%	66.7%
Total	15	45	45	40	5	150
	10.0%	30.0%	30.0%	26.7%	3.3%	100.0%

In Table 4.26, more than half of the respondents (n=100, 66.7%) responded 'No' to having manual or anything to guide their activities. However, 50 respondents representing 33.3% stated 'Yes' to having manuals to guide their activities. A disaggregation of the results according to the level of education of the respondents showed a statistically significant association between the responses given by the respondents and their level of education (Pearson's chi-square=50.000, $p < .05$).

Table 4.27 have you been educated on the hazards of mining? * Educational level Cross tabulation $\chi 2=23.047$, p-value=.001

	Educational level					Total
	Junior Sec	middle school	senior high	Technical/Vocational	University	
Yes	5	10	25	25	5	70
	33.3%	22.2%	55.6%	62.5%	100.0%	46.7%
No	10	35	20	15	0	80
	66.7%	77.8%	44.4%	37.5%	.0%	53.3%
Total	15	45	45	40	5	150
	10.0%	30.0%	30.0%	26.7%	3.3%	100.0%

Results showing in Table 4.27 above depicts that more than half of the respondents (n=80, 53.3%) have not received any education on the hazards of mining whereas 70 respondents representing 46.7% have received education on the hazards of mining. Again, chi-square analysis of the results ($\chi 2=23.047$, $p < .05$) showed a statistically significant association between the responses given and their level of education.

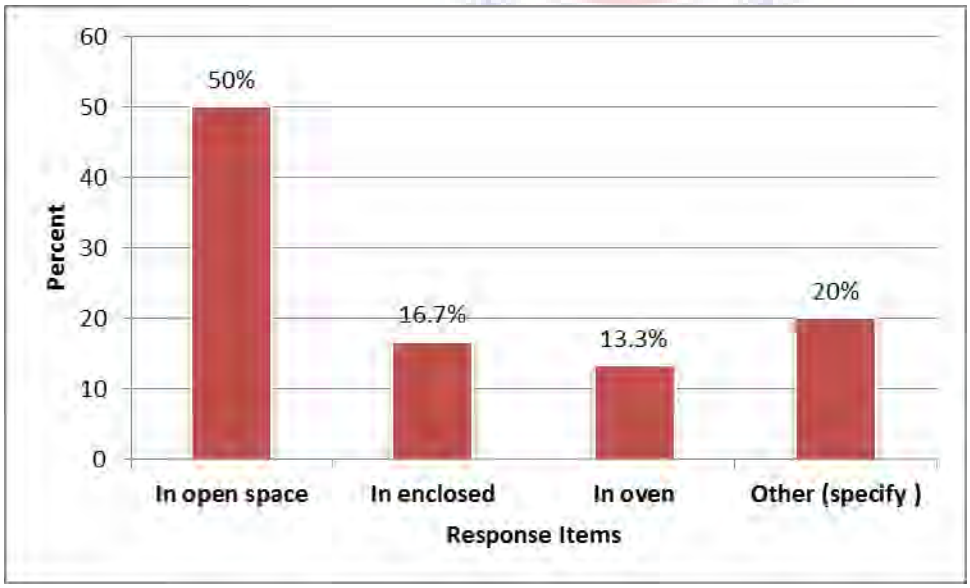

Figure 4.7 Where do you burn (dry) the wet gold?

Respondents were asked to point out where they burn the wet gold. Analysis of the responses shows that 50% of the respondents burn 'In Open Space' whereas approximately 17% burn in 'Enclosed'. Also, 13.3% burn 'In the Oven'. In addition, 20% specified other places of burning the wet gold.

In the study of Kessey and Arko (2013) the gold-mercury amalgam takes place by heating a sauce pan with a lid. Although this is an improved process, the miners finally throw the mercury residue, in the sauce pan, on the ground allowing it to escape into the atmosphere, soil and rivers. Thus, Mercury contamination in water system disrupts the aquatic ecosystem and then eventually affects humans. (Veiga et al, 2006).

Table 4.28 What chemicals do you use to put the powdered gold together? * Educational level Cross tabulation $\chi 2=14.224$, p-value=.001

	Educational level					Total
	Junior Sec	middle school	senior high	technical/vocational	University	
Mercury	15	45	45	35	5	145
	100.0%	100.0%	100.0%	87.5%	100.0%	96.7%
Cyanide	0	0	0	5	0	5
	.0%	.0%	.0%	12.5%	.0%	3.3%
Total	15	45	45	40	5	150
	10.0%	30.0%	30.0%	26.7%	3.3%	100.0%

In Table 4.28 above, almost all the respondents (n=145, 96.7%) use mercury to put the gold together. On the other hand, 5 respondents consisting of 3.3% resort to cyanide to bind the gold together. A further break down of the responses showed a statistically significant association between the responses given by the respondents and their level of education (Pearson's chi-square=14.224, $p < .05$)

"Dust and gaseous fumes of chemicals like mercury and others exposes into the environment during the operations of small-scale mining poses danger to the mine workers and the people living and around these areas. This happens because the burning of amalgam and mercury is done in poorly ventilated areas and others in openly spaces. Aryee et al (2003), explain that "small-scale mining operations that involve size reduction of ore generate some dust that could be hazardous to human health since the particles generated from such sources fall within the respirable dust range and are capable of causing dust related diseases".

CHAPTER FIVE

DISCUSSIONS OF RESULTS

This chapter discusses the results and findings obtained with regards to the research questions.

5.1 Socio - Demographic of respondents

Table 4.1 indicated demographic characteristics of 25 respondents representing 16.7% each drawn from 6 communities, namely Ahansoyewodea, Pomposo, Akrokerri, Kwabrafoso, Asonkori and Akaporiso. Further analysis showed that there were a total of 45 females representing 25% of the total respondents whereas 105 representing 75% being males.

Again, from Table 4.1, it could be seen that majority of the respondents 40% were aged from 21 – 30 years whereas approximately 33% were aged from 31 - 40 years.

Furthermore, Table 4.1 also presented the level of education of the respondents. The results revealed that majority of the respondents 30% for each was Middle School and Senior High School leavers were engaged in the small-scale mining.

This indicated that small-scale gold mining is a major source of employment for Senior High School and Middle School leavers. Some Senior High School leavers take to mining as result of either poor performance in the final examination or inability to continue schooling as a result of household poverty.

5.2 Employment Opportunities

As indicated in Table 4.2 above, item related to whether the small-scale mining activities had improved their living conditions. The results showed that more than two-thirds of the respondents (n=130, 86.7%) reported 'Yes' to experiencing improved living conditions as a

result of the small- scale mining activities. Some of the people said their lives had improved as compared to when they were not in to that business. The income they received enables them to cater for their families, paid wards school fees and other utilities like electricity, telephone (recharging of mobile phones), water and among others.

On the benefits, Table 4.3, indicated that nearly two-thirds of the respondents (n=95, 63.3%) reported of earning 'Income' whereas, 43 of the respondents representing 28.7% stated they are 'able to care for their families' as a result of the small-scale mining. Also, 12 respondents making up 8% were able to pay their rents as a result of the mining activities they are involved in.

From Table 4.4 and 4.5, it could be observed that more than half of the respondents (n=100, 66.7%) reported of living in their family house whereas, 50 respondents represented about 33% reported of staying in Rented houses.

From Figure 4.1, it could be observed that in Ahansoyewedea and Asonkori there were more responses for 'Yes' than 'No' suggested that there were more houses in the community with toilet facilities than those without it.

On the contrary, in Akrokerri, Pomposo, Kwabrafoso, and Akaporiso indicated there were more 'No' than 'Yes' implied that majority of the houses in the community do not have toilet facilities.

This could be a challenge in terms of sanitary conditions in the communities under study.

People could easily defecate in unauthorised places in and around the community when nature calls.

Table 4.6 was a Cross tabulation of the result regarding the type of water available to the respondents in the various communities. The results showed that more than half of the respondents (n=85, 56.7%) have pipe borne water whereas 60 respondents represented 40% have wells. Also, only 5 (3.3%) respondents reported of streams.

The activities of miners pollute rivers and streams nearby that serve as a source of drinking water for communities downstream. This situation had call for most of the people living in these areas to depend on pipe born and well water rather than streams or rivers.

Table 4.7, indicated the number of times respondents eat in a given day. It could be observed that exactly half of the respondents (n=75, 50%) eat twice in a day, whereas, 70 respondents (46.7%) eat three times in a day.

In Table 4.8, the respondents were asked whether they have any other business apart from the mining activities engaged in. Analysis of the responses showed that more than half of the respondents (n=85, 56.7%) reported 'No' to having some other business apart from what they are doing. However, 65 respondents represented 43.3% reported of having other businesses apart from the small- scale mining activities they are involved in.

The unemployment rate in the country had compelled most of the youth to enter into the small-scale mining industry which some said the business helps rather than staying idle.

Indicated in Figure 4.2, respondents who reported of having other business were asked to indicate who manage the business for them. The results as shown in the Figure above indicated that majority of the respondents have left their businesses in the hands of Care takers (43%) whereas 30% have employed people to manage their business. Meanwhile 23% reported that

family members were taken care of their businesses. Only 3% of the respondents were managed it by themselves.

The interview conducted also revealed that, some had invested the money they received from the small-scale mining into businesses like provision stores, hardware, cement and iron rods stores, and had employed people to take care of the venture(s).

The report published by World Bank, entitled strategy for African mining, "It is estimated that 30,000 people are employed within the legalized segment of the Ghanaian small-scale mining sector".

Businesses and other trading activities go on in the small-scale mining areas and as a result provides employment opportunities for the youth and other groups of people.

5.3 Method of Operation of small-scale mining

In Table 4.9, it could be observed that more than two-thirds of the respondents (n=115, 76.7%) responded 'Yes' to acknowledging any differences between the operations of small-scale and large-scale mining. However, 35 respondents represented 23.3% responded 'No' to any differences between the operations of small - scale and large - scale mining.

A follow up to Table 4.9, respondents were required to give their opinions on what accounts for the differences. The results showed in Table 4.10 depicted that more than half of the respondents (n=78, 52%) pointed at the Equipment Used, whereas 52 respondents represented 34.7% stated the use of chemicals. Meanwhile 20 respondents consisted 13.3% stated the land size.

The local made equipment's or tools, the size of land contribute greatly to the production of the mineral (gold) since majority saw that some equipment were capital intensive which cannot be borne by an individuals.

Table 4.11, it could be seen that all the respondents (n=150, 100%) stated that they use locally made tools in their activities. This had confirmed that, majority of the small-scale miners used locally made tools in their activities as stated in Aryee et al, 2003 reports.

From Table 4.12, more than 40% of the respondents (n=65) reported of operating in the Forest whereas 35 consisted 23.3% respondents operated in River banks and underground. Also, 35 respondents represented 23.3% stated they operated underground. Only 15 respondents being 10% operated on the Surface. Those operated in the forest destroy the vegetation and the forest and make the land infertile for agriculture productivity. Lands that were formerly used for cultivation of food crops and other cash crops had been taken by mining operators. Consequently, food production has decreased considerably, creating a very high cost of living in such areas in the country.

Small-scale mining sites close to rivers, the tailings (waste left after ore processing) are washed directly into the rivers. As tailings enter the surrounding rivers, they pollute the rivers, changing the colour of water to deep brown although water is colourless and makes it unwholesome. This was observed in Table4.13.

Exactly half of the respondents (n=75, 50%) have had training on safe working practices whereas the remaining half (n=75, 50%) reported of not having any training on safe working practices.

Table 4.14 above suggested that more than half of the respondents (n=80, 53.3%) reported 'Yes' to having policies on safety. However, 70 respondents represented 46.7% responded 'No' to having any safety policy at the workplace.

A study conducted by Hentschel et al, (2002), states that "many small - scale mining operations are said to be lacking the following –safety regulations, reinforcement of mine safety requirements awareness of the risks inherent in mining, and access to better equipment". "Dust and gaseous fumes of chemicals like mercury and others exposes into the environment during the operations of small scale mining poses danger to the mine workers and the people living and around these areas. This happens because the burning of amalgam and mercury is done in poorly ventilated areas and others in openly spaces". This confirms the results presented in Table 4.14.

The results as being presented in Table 4.15 above shows that more than half of the respondents (n=100, 66.7%) report accidents to the Police whereas (n=30, 20%) report to other authorities. In addition, (n=20, 13.3%) report to the Chairman of the small - scale mining association. Accident cases were common due to negligence of overlooked some basic safety rules in mining.

5.4 Support from Government/ mineral commission

From Table 4.16, all the respondents (n=150, 100%) declared they do not have operating licenses for their businesses. Also the table presented the results in relation to the community of residence of the respondents.

Figure 4.3 above, approximately 77% of the respondents responded 'Yes' to experiencing difficulties in securing licenses for their business operations. However, about 23% of the respondents declared otherwise.

In a report by Ghanaian Chronicle dated 17th June, 2013, under the theme "optimizing the developmental benefits of small-scale mining".

A small- scale miner and Director of Christal Mining Consult, Mr. Kofi Boateng "enumerated various challenges including difficulty in acquiring registration and permit …")

In Table 4.17 above, it could be observed that exactly half of the respondents (n=75, 50%) stated the National Capital Accra is the place one can secure license for their operations. Again, 55 respondents representing 36.7% reported of the Regional Capitals whereas 20 respondents also constituted about 13% stated licenses could be ascertained from the Municipal Assembly.

Many small-scale miners feel it is unnecessary to apply for a permit to work on lands that they traditionally view as theirs', even though they do not have legal titles. Moreover, most of the small-scale miners disclosed that the bureaucratic application procedure is complicated, slow, and believed to favor government allies.

A report by the Ashanti Regional Director of the Environmental Protection Agency (EPA), Isaac Owusu, called for decentralization of the system involved in issuing permit to miners, stressing that the current state whereby all documents are processed in Accra does not augur well for the smooth operations of the small - scale mining in the country.

Table 4.18 showed that none of the respondents received any support from the government as declared by all the respondents (n=150, 100%).

The government can provide support to the small scale- miners by creating small–scale mining (agro) industries in Rural and District Capitals. This would provide job and employment opportunities for the up and coming youth in the area and also reduce the unemployment rate in the country. The government in collaboration with revenue authorities could also force them to pay their taxes.

In Figure 4.4 respondents who responded 'No' to receiving support from the government were asked to suggest where they get their financial support from. The Figure portrayed that more nearly half of the respondents (n=70) are self-financed their businesses whereas 40 respondents borrowed from friends. In addition, 35 respondents resorted to family support and only 5 respondents took bank loans.

The miners indicated that they financed their activities from personal savings and informal arrangements with "gold dealers". They said that, the system of financing their operations makes it difficult for ground workers to generate adequate funding for their activities. Since the gold dealers would deduct all monies put in as financial support after a period of work. The remainder (money) then shared among the team by the dealer.

Table 4.19 indicated that almost all the respondents (n=145, 96.7%) self-provide their tools and equipment's for their operations whereas 5 respondents representing 3.3% on the other hand receive their tools and equipment from NGO's. Simple equipment's like shovels, pick-axes, pans, hammers, chisels, buckets and others were provided by themselves.

From Table 4.20, it could be observed that most of the respondents' businesses (n=135, 90%) are not recognised by the Ghana Revenue Authority (GRA) whereas only 15 respondents representing 10% have their businesses recognised by the GRA. The indication is that most of the small-scale miners do not pay their revenue (tax) to the government.

From Figure 4.5 above, majority of the respondents (90%) declared they do not pay taxes whiles only 10% pay their taxes.

In support of this, the Minister of Finance and Economic Planning, Dr. Kwabena Duffour, stressed that the country has many self- employed professionals such as accountants, engineers, pharmacists, medical doctors, lawyers, bankers insurers, among others earning more than average income. However, the contributions to overall income tax revenue of many of these professionals, educated with the taxpayer's money has been very low (around five per cent) compared to other income tax payers.

The fifteen respondents who paid their taxes were asked to indicate how often they honour their tax obligation and the results showed in Table 4.21 suggested that majority (n=7, 47%) paid taxes six monthly, whiles 6 (40%) paid yearly. Only 2 respondents (13.3%) paid three monthly.

Regarding being guided by rules and regulations, more than two-thirds of the respondents (n=123, 82%) reported 'Yes' to having rules and regulations that guided their operational activities. However, 27 respondents representing 18% reported 'No' to having rules and regulations.

The laws which govern the small-scale mining are somehow confused and inconsistent. Needless to say, all the attention is primarily on the large-scale mining. Indeed the government disregard the small-scale mining sector may cost the nation dearly in the long run.

That said, in order to achieve the maximum benefits, it is extremely important that society as a whole must have an interest in promoting and strengthening the role of small-scale mining in national development. In addition regulating and strengthening of the developmental potential of the sector must be of heightened importance to the government.

In Figure 4.5, the results depicted that nearly half of the respondents (n=71) responded 'No' whereas, 52 respondents responded 'Yes' to complying with the rules and regulations governing mining. However, 27 respondents declared they sometimes complied with the rules and regulations.

Anglo Gold annual report (2006) states that "there are substantive legislation hurdles in many countries characterized by either a lack of regulation, ambiguous legislation or legal framework which is inappropriate to small-scale operators and, consequently, is not enforced".

From Table 4.23, it could be observed that more than half of the respondents (n=100, 66.7%) responded 'Yes' to the effect that there was a penalty for abusing the rules and regulations guiding mining. However, 45 respondents represented 30% stated 'No'. Five respondents made up 3.3% on the other hand indicated that there was a 'sometimes' a penalty for abusing the rules and regulations. The small-scale miners in an interview disclosed that sometimes portion of land owners could sanction some groups not to work in certain areas of the land as it cabinet to pass law to punish illegal miners.

5.5 Effects of Education

In Table 4.24, respondents were asked to indicate how long they have been in small scale mining. The results suggested that nearly half (n=70, 46.7%) have worked for 1 year to 5 years whereas 55 respondents represented 36.7% have worked for 6 years to 10 years. Again, 20 respondents consisted 13.3% have worked in small-scale mining for more than 10 years. The results are further presented in relation to the level of education of the respondents.

From Table 4.25, the results showed that more than half of the respondents (n=80, 53.3%) learned how to do small-scale mining from their friends whereas 70 respondents being 46.7% were taught by their relatives. Most of the small-scale miners were inexperienced and with little or no knowledge about the work that could results in negative effects to the workers, environment and other living organisms. The International Labour Organisation (ILO) noted in a recent resolution that the lack of resources, skills and knowledge meant that many small-scale mining operations suffered from low productivity, inadequate incomes and poor safety and working conditions.

In Table 4.26, more than half of the respondents (n=100, 66.7%) responded 'No' to having manual or anything to guide their activities. However, 50 respondents represented 33.3% stated 'Yes' to having manuals to guide their activities.

There were no manual which spelled out the rules and regulation guiding their activities they were applying self knowledge and experienced.

Results showed in Table 4.27 above depicted that more than half of the respondents (n=80, 53.3%) have not received any education on the hazards of mining whereas 70 respondents represented 46.7% have received education on the hazards of mining.

Most small-scale miners live in mining camps that are located away from their homes. Their working methods and environment expose them to chemical contaminants, heat stress, ergonomic problems, unsafe equipment and mine structures, unsanitary conditions, malaria, and alcohol consumption further decrease the body's natural resistance mechanism to disease. (Walle and Jennings, 2001)

Again, Henstchel et al (2002) "gave the causes of the various negative environmental impact of small-scale gold mining as lack of knowledge, education and training of miners, inefficient technology for mining; inefficient public administrative management, challenges in human control, economic limitations and human survival, lack of access to better techniques, lack of information on best practices, lack of control and enforcement of policies, non-implementation of environmental legislations and low capital base implying reduction in investment."

Respondents were asked to point out where they burn the wet gold. Analysis of the responses shows that 50% of the respondents burn 'In Open Space' whereas approximately 17% burn in 'Enclosed'. Also, 13.3% burn 'In the Oven'. In addition, 20% specified other places of burning the wet gold.

In the study of Kessey and Arko (2013) "the gold-mercury amalgam takes place by heating a sauce pan with a lid. Although this is an improved process, the miners finally throw the mercury residue, in the sauce pan, on the ground allowing it to escape into the atmosphere, soil and rivers"

Again, "Mercury contamination in water system disrupts the aquatic ecosystem and then eventually affects humans" (Veiga et al, 2006).

In Table 4.28 above, almost all the respondents (n=145, 96.7%) used mercury to put the gold together. On the other hand, 5 respondents consisted of 3.3% resorted to cyanide to bind the gold together.

"Dust and gaseous fumes of chemicals like mercury and others exposes into the environment during the operations of small - scale mining poses danger to the mine workers and the people living and around these areas .This happens because the burning of amalgam and mercury is done in poorly ventilated areas and others in openly spaces. Aryee et al (2003), explain that "small - scale mining operations that involves size reduction of ore generate some dust that could be hazardous to human health since the particles generated from such sources fall within the respirable dust range and are capable of causing dust related diseases".

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

In this chapter, the researcher presents to the discerning readers summary of findings of the study considering each of the research questions in order they appeared in chapter one. Again, conclusions were drawn from researcher's interpretations of the findings followed by recommendations on actions that need to be taken by appropriate individual and authorities.

Finally, suggestions were made to other researchers for further research on the problem. The summary of findings on the management of the operations of small-scale mining industries is presented in under the following themes:

- How do the small-scale mining industries help to improve the lifestyle of the people living in and around this community?
- How do the operations of the small-scale mining industries differ from that of large scale ones?
- How does the Government/Mineral Commission support the small-scale mining industries?
- How does educational level of the people involved affected the operations of the small-scale mining industries?

6.1 FINDINGS

The main findings of the study in relation to how do small-scale mining industries help to improve the life style of the people living in and around the community were:

i. More than two-thirds of the respondents (86.7%) experienced improvement in living conditions as a result of the small- scale mining activities.

ii. Nearly two-thirds of the respondents (63.3%) reported of earning 'Income' whereas, 43 of the respondents (28.7%) stated they were 'able to care for their families' as a result of the small-scale mining. Also, 8% were able to pay their rents as a result of the mining activities they are involved in.

iii. More than half of the respondents (60%) responded not having accommodation whereas 40% of the respondents said they had accommodation.

iv. Majority of the respondents (66.7%) lived in their family house whereas, 50 respondents (33.3%) stayed in Rented houses.

v. It could be observed that in Ahansoyewedea and Asonkori there were more responses suggested that there were more houses in the community with toilet facilities than those without it. On the contrary, in Akrokerri, Pomposo, Kwabrafoso, and Akaporiso indicated there were majority of the houses in the community do not have toilet facilities.

vi. More than half of the respondents (56.7%) had pipe borne water whereas 40% respondents had wells. Also, only (3.3%) respondents reported of streams.

vii. It could be observed that exactly half of the respondents (50%) ate twice in a day, whereas, respondents (46.7%) ate three times in a day.

viii. More than half of the respondents (56.7%) reported they had no other business apart from the small-scale mining. However, respondents (43.3%) reported they had other businesses apart from the small- scale mining activities they were involved in.

ix. Majority of the respondents indicated that they had left their businesses in the hands of Care takers 43% whereas 30% had employed people to manage their business. Meanwhile 23% reported that family members were taken care of their businesses. Only 3% of the respondents were managed by themselves aside the small-scale mining.

The findings in relation to differences between the small-scale mining and the large scale mining were:

i. Majority of the respondents (76.7%) responded to acknowledge the fact there were differences between the operations of small-scale and large scale mining. However, respondents (23.3%) stated no differences between the operations of small-scale and large scale mining.

ii. More than half of the respondents (52%) pointed at the Equipment used, whereas 34.7% of respondents stated the chemicals used. Meanwhile respondents consisted 13.3% stated the land size.

iii. All the respondents (100%) stated almost all the small-scale miners used locally made tools in their activities.

iv. More than 40% of the respondents reported of operated in the Forest whereas 23.3% respondents reported that miners operated in River banks. Also, respondents (23.3%) stated they operated underground. The rest of the respondents (10%) reported miners operated on the Surface.

v. Exactly half of the respondents (50%) have had training on safe working practices whereas the remained half (50%) reported of not having any training on safe working practices

vi. More than half of the respondents (53.3%) reported they had policies on safety. However, 70 respondents (46.7%) reported they had no safety policy at the workplace.

vii. More than half of the respondents (66.7%) indicated that accidents were reported to the Police whereas (20%) reported accidents to other authorities. In addition, (13.3%) reported accidents to the Chairman of the small-scale mining association.

The findings in relation to the support the government/minerals commission provide to the small-scale mining were:

i. All the respondents (100%) declared they do not have operating licenses for their businesses

ii. Majority 77% of the respondents declared that they experienced difficulties in securing licenses for their business operations. However, about 23% of the respondents declared otherwise.

iii. Respondents (50%) stated the National Capital Accra was the place one can secure license for their operations. Again, respondents (36.7%) reported of the Regional Capitals whereas the rest of respondent (13%) stated licenses could be ascertained from the Municipal Assembly.

iv. All the respondents (100%) indicated that they don't receive any support from the government.

v. Respondents (46.7%) stated they financed businesses by themselves whereas (26.7%) respondents borrowed money from friends. In addition, (23.3%) respondents resorted to family support and only (3.3%) respondents took bank loans.

vi. Almost all the respondents (96.7%) stated that they self-provided their tools and equipments for their operations.

vii. Most of the respondents' (90%) businesses were not recognised by the Ghana Revenue Authority (GRA) whereas respondents 10% have their businesses recognised by the GRA.

viii. Majority of the respondents (90%) declared that they do not pay taxes whiles only 10% pay their taxes.

ix. The fifteen respondents who said they paid their taxes indicated and majority (47%) paid taxes six monthly, whiles (40%) paid yearly. Only (13.3%) respondents paid three monthly.

x. More than two-thirds of the respondents (82%) reported have rules and regulations that were guided their operational activities. However, 18% reported that they have rules and regulations.

xi. Nearly half of the respondent (47.3%) responded they do not comply whereas, (34.7%) responded that they complied with the rules and regulations governing mining. However, (18%) declared they sometimes complied with the rules and regulations.

xii. More than half of the respondents (i.e. 66.7%) responded to the effect that there was a penalty for abusing the rules and regulations guiding mining. However, respondents (30%) stated 'No'. Five respondents made up of (3.3%) on the other hand responded that there is 'sometimes' a penalty for abusing the rules and regulations.

The findings in relation to the educational level of the small-scale miners and its effects were:

i. Respondents were asked to indicate how long they have been in small scale mining. The results suggests that nearly half (46.7%) have worked for 1 year to 5 years whereas 36.7% respondents have worked for 6 years to 10 years. Again, 13.3% of respondents have worked in small - scale mining for more than 10 years

ii. More than half of the respondents (53.3%) indicated that they learned how to do small-scale mining from their friends whereas 46.7% respondents were taught by their relatives.

iii. Majority of the respondents (66.7%) responded they do not have any manual or anything to guide their activities. However, 33.3% stated they had manuals to guide their activities.

iv. More than half of the respondents (53.3%) have not received any education on the hazards of mining whereas 46.7% have received education on the hazards of mining.

v. Majority of the respondents (50%) declared they burnt the wet gold 'In Open Space' whereas approximately 17% burnt in 'Enclosed'. Also, 13.3% burnt 'In the Oven'. In addition, 20% specified other places of burning the wet gold.

vi. Almost all the respondents (about 96.7%) indicated that they used mercury to put the gold together. On the other hand, 3.3% respondents of resorted to cyanide to bind the gold together.

6.2 Conclusions of the Study

On the basis of the results obtained in this study, the following conclusions were reached:

i. The living condition of the people engaged in the small-scale mining could be improved if the activity is well managed. Despite the difficulties in their operations some mentioned that they received income that enabled them to take good care of their family and other responsibilities like rented rooms, built houses to accommodate their families. Besides, they enjoyed good drinking water (pipe born, well water) eats well provided one had money, which makes life better off than doing nothing. Again, others had established businesses and employed some other people to manage the business which served as employment creation.

ii. The small-scale gold mining and that of large-scale gold mining differs in their operations in terms of the equipment used; the large scale used heavy equipments, the chemicals, large portion of the land, whiles the small-scale mining mostly used locally made tools and equipments, and normally operated in the forest, river banks. Most of the operators had not received adequate training on the safe working practices of mining and that had negatively affected our environment, polluting of water bodies creating an unnecessary pit which serves as dead traps, and breeding places for mosquitoes that spreads malaria. Again, the inadequate information on safety policy sometimes resulted in injuries and accidents to themselves and others. Accident cases were sometimes reported to the police for the necessary actions to be taken.

iii. Majority of the small-scale miners do not have license for their operation and because of that they operate undercover. Miners experienced difficulty in securing license for the smooth operation of the small-scale business. Some of the miners indicated that the process of securing license at the national capital –Accra was a big challenge. Small-scale miners were embittered and said they didn't receive any support from the government. The miners indicated that they pre-finance their business by way of purchasing made in Ghana equipments and tools for their activities. The miners were not recognized by the revenue collectors and because of that most of them did not pay income tax. They emphasized that they observed the rules and regulations governing mining which sometimes protected them from accidents and injuries. Abusing the rules and regulations in the mining could attracted some finds or penalty for the individual.

iv. The small-scale miners who had been in that business within five (5) years was outnumbered those within ten (10) years and above. Most indicated that they learnt the

small- scale mining from friends without any proper education on the operations of small scale mining, and as such no manual to guide the activities. Again, majority stated that they had not received any education on the hazards of mining. The air and the environment is polluted as larger group indicated the wet gold is burnt in an open space which they mainly used mercury to put the powdered gold together.

6.3 Recommendations

The observations that were made through this study point to the fact that more intensive researches are required in addressing the management of small-scale gold mining activities and environmental challenges.

Generally, this study has confirmed that the issue of the management of the activities of small-scale gold mining and environment is a complicated one. It borders on legislative instrument and policies implementation, public institutional failure, rural poverty, use of rudimentary tools, poor technology, and low level of education among the miners and the attitude of some miners. Addressing these issues requires a logical progression by the State to enforce several laws on small-scale gold mining in Ghana.

- The government and the mineral commissions should help in decentralization of licence points and also removes all bottlenecks in the registration process for groups of people or individual's. Again, the EPA should officially inspect the mining sites for land filling or land reclamation before license is renewed.
- The government and the municipal or district assemblies can establish small-scale mining site(s) in some of our communities so that the youth (school dropout) can be employed

and contribute their quota in the form of tax to the revenue authorities and the government.

- ❖ Adequate financial support and technical equipment should be provided for small-scale mining and environmental regulatory institutions to ensure effective monitoring of mine operations around the country in general,

- ❖ The complete banning of illegal mining activities should have another look and if possible assist the illegal miners "galamsey " operators to control their activities to conform and subject to rules or laws of the country.
- ❖ The state in collaboration with other agencies should be charged to develop training curriculum or manual for educating small-scale gold miners on the direct link between their activities that can manage and sustain small-scale mining in the country.
- ❖ The Minerals Commission of Ghana should embark on education programs to sensitize the small-scale miners on safe mining and tailings disposal practices as well as on other environmental and safety issues, especially on the health hazards associated with the use of mercury in the treatment of amalgamated gold.
- ❖ The government and the stakeholders can help the small-scale miners to access financial support when form co-operatives, companies or an enterprise to improve their lot.

6.4 Suggestions for Future Research

1. Research should be conducted on the impacts of small-scale mining on the workers and their families.

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APPENDIX

UNIVERSITY OF EDUCATION, WINNEBA-KUMASI

DEPARTMENT OF DESIGN AND TECHNOLOGY EDUCATION

QUESTIONNAIRE FOR SMALL- SCALE MINING INDUSTRIES

This questionnaire is designed for the purpose of collection of data for a study on **the management of the operations of small-scale mining industries at Obuasi** at the municipality in the Ashanti region. The research is being carried out by student of the above mentioned University. All information is for academic purposes only; responses will be confidential and will not be connected in any way to yourself or your group.

Please, tick [√] the appropriate response(s) and fill or write in the space where possible.

Thank you.

A. Socio-Demographic Information		
A1	Name of respondent	
A2	Age	1.≤ 15 years [ ], 2. ≤ 20 years [ ], 3. ≤ 30 years [ ], 4.≤ 40 years [ ], 5. ≤ 50 years [ ], 6.>50 years [ ],
A3	Sex	1. Male [ ], 2. Female [ ]
A4	Community/Town	1. Ahansoyewodea [ ], 2.Pomposo [ ], 3.Arokerri [ ], 4. Kwabrafoso [ ], 5.Asonkori [ ], 6.Akaporiso [ ],

A5	Main Occupation	1. Small-scale miner [ ], 2. Farmer [ ] 3.Government Employee [ ], 4.labourer [ ], 5. Other (Specify)…….
A6	Educational Level	1.Primary [ ], 2.Junior secondary [ ], 3.Middle school[ ], 4. Senior secondary [ ], 5.Technical/Vocational [ ], 6. Post-secondary [ ], 7.University [ ], 9.Adult literacy [ ], None [ ],
B. Improvement of living condition		
B1	Does the activities of small-scale mining help improve your living condition	1. Yes [ ], 2. No [ ],
B2	What are the benefits of small–scale mining to you	
B3	Do you have your own accommodation	1. Yes [ ] 2. No [ ],
B4	If No, where do you and your family live	1.rented house [ ] 2.family house [ ] 3.friend's house [ ] 4.perching with someone [ ] 5.other (specify)
B5	Do you have toilet facility in the house you live?	1. Yes [ ] 2. No [ ] 3.other (other specify)
B6	What type of water do use in your homes (***you may tick more than one response)***	1. pipe borne water [ ] 2.stream [ ] 3.river 4.well /borehole[ ] 5 .other (specify)
B7	How many times do you eat in a day (***you may tick more than one response)***	1. one [ ] 2. two [ ] 3.three [ ] 4.four 5. other (specify)

B8	Do you have any other business apart from this work	1,Yes[ ] 2.No [ ]
B9	If Yes, how do you manage this business?	1. Self [ ] 2.caretaker [ ] 3.family member [ ] 4.employee [ ].
C. The method of operations of small-scale mining		
CI	Is there any difference between the operations of small-scale and that of large scale mining?	1.Yes [ ] 2.No [ ]
C2	In terms of what? ***You can tick more than one***	1. The Land size [ ] 2.The Equipments used [ ] 2. The chemicals used 4. Other (specify)
C3	What tools/ equipments do you use in your activities?	1. Locally made tools [ ] 2. Heavy equipments [ ] 3.other (specify).
C4	Where do you operate? ***You can tick more than one.***	1 Surface. [ ] 2 Underground [ ] 3. River banks 4 Forest [ ] 5. other (specify)
C5	Have you attended any training/seminar concerning save working?	1. Yes [ ] 2. No [ ]
C6	If Yes, who organized it?	1. EPA [ ] 2. Mineral commission [ ] 3 NGO [ ] 4.Other (specify)
C7	If yes, how has it benefited you	
C8	State some of the skills you have acquired from such training	
C9	Do you have any safety policy?	1. Yes [ ] 2. No [ ]

C10	To whom do you report accident to?	1. Chairman of small scale mining [ ] 2.Police [ ] 3.EPA. [ ] 4.Mineral Commission [ ] 5. Other (specify)
		Specify)
D. The support of Government/ Mineral Commission to small scale mining industries		
D1	Do you have license in operating this business?	1. Yes [ ] 2. No [ ]
D2	Is there any difficulty in securing the license for the business?	1. Yes [ ] 2. No [ ]
D3	Where can one secure this license?	1.National capital Accra [ ] 2.Regional capital [ ] 3.Municipal Assembly[ ] 4.other (specify)
D4	Do you receive grant or support from the government?	1. Yes [ ] 2. No [ ]
D5	If No, where do you financial support?	1. Bank loan [ ] 2 Borrow from friends [ ].3.family support [ ] 3.self financing [ ]
D6	Who provides you with tools and equipments for work?	1.Government [ ] 2.NGO [ ]3.Mineral Commission[ ]4.self provider 5.other (specify)
D7	Is your business recognized by Internal Revenue Service?	1. Yes [ ] 2. No [ ]
D8	Do you pay Income Tax?	1.Yes [ ] 2.No [ ]
D9	If Yes, how often do you pay the Income Tax?	1.Monthly [ ] 2.Three monthly [ ] 3.Six monthly [ ] 4.Yearly 5.Other (specify)
D10	If No, why?	

D11	Do you have rules and regulations that are guided by operational activities?	1. Yes [ ] 2. No [ ]
D12	Do you comply with the rules and regulations governing by mining?	1. Yes [ ] 2. No [ ] 3. Sometimes [ ]
D13	Is there any penalty for abusing the rule	1. Yes [ ] 2. No [ ] 3. Sometimes [ ]
E. Effects of education on small-scale		
E1	For how long have you been in small-scale mining?	.≤ 6 months [ ], 2. ≤ 1 year [ ], 3. ≤ 5 years [ ], 4.≤ 10 years [ ], 5.10> years [ ],
E2	Who taught you how to do small-scale mining?	1. Relative [ ] 2.Friend [ ] 3. [ ] 4. Training programme [ ] 5. Other (Specify)
E3	Do you have manual or anything to guide your activities	1. Yes [ ] 2. No [ ]
E4	Have you been educated on the hazards of mining	1.Yes[ ] 2.No[ ]
E5	Where do you burn (dry) the wet gold?	1. In open space [ ] 2. In enclosed [ ] 3. In oven [ ] 4. furnace [ ]
E6	What chemical do you use to put the powdered gold together?	1. Mercury [ ] 2. Cyanide [ ] 3.sulphide 4.other (specify)
E7	What is your general impression about small-scale mining activities in this area?	