EFFECTS OF ARTISANAL AND SMALL SCALE MINING ON THE ENVIRONMENT AND LIVELIHOODS IN GHANA: A CASE STUDY OF SELECTED MINING COMMUNITIES IN THE UPPER EAST REGION.

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF

MASTER OF SCIENCE IN DEVELOPMENT POLICY AND PLANNING, DEPARTMENT OF PLANNING: COLLEGE OF ARCHITECTURE AND PLANNING.

APRIL, 2012

DECLARATION

I hereby declare that this submission to The School of Graduate Studies, KNUST, is my own work towards the MSc Programme in Development Policy and Planning and that to the best of my knowledge, it contains no material published or submitted to any other Institution; academic or otherwise. Due acknowledgment has been made in the text for references to works of interest and bearing to this study.

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ABSTRACT

Around the developing world especially, Artisanal and Small Scale Mining, has done tremendous damage to water bodies and to the wider environment which has led to many calls for a clamp down on the sector. However, the sector has a striking cord with poverty and deprivation. From Asia to Africa and to South America, ASM is a poverty driven industry. The UN's efforts at addressing the issues have been quite microscopic basing on issues such as technicalities, environmental and quite recently alternative livelihood concerns whiles ignoring the very wide and deep socio-economic issues encompassing the ASM sector.

Thus, this study focused on analyzing the environmental, livelihood and other socio-economic issues of ASM as they affect the people of the Upper East Region. The discussion therefore, brings to the fore, the micro ASM and community development issues.

Using a case study approach, the Talensi Nabdam mining belt which has the highest concentration of ASM activities was chosen. Data was obtained at the District and at the regional capital town – Bolgatanga. Interviews were administered to 138 miners, 8 institutions and other stakeholders. To have qualitative enquiry on the issues, community forum involving 324 people were organized in the six mining communities of Gbani. Most of the study's secondary data was sourced from issues in the news, journals and renowned publications for relevant information.

The survey found out that, extreme poverty, long off farm activities, flooding, post harvest losses , low skill and high illiteracy levels are some of the causes of increased ASM activities. It was also revealed that ASM is worsening the environmental problems of the region, increasing malaria and HIV cases among others but employs over 10,000 people of the region, who see the gold mining as a timely recipe to eliminating poverty, hunger and deprivation and will do anything to continue mining. The people were found not to be ignorant and unappreciative of the negative aspects of ASM and are yearning for government support to minimize them.

It is against this back drop, that the study recommends incisive policy emanating from consultations and inputs from stakeholders especially in mining communities to make them feel they owe the policies. as was done in China for the people of Shouzhou and Duyun small scale mining areas. Policies on environmental protection and other important mining rules subservient to the national mining laws can be strategically enshrined in the District's Medium Term Plans and given the necessary support from Regional Coordinating Council and central government for effective implementation to minimize the negative effects of ASM and to strengthen capacities of the people against losses due to low technology and exploitation by middlemen. This could culminate into enhancing wealth creation and help alleviate the region's extreme poverty level of 84%.

ACKNOWLEDGEMENTS

I am extremely grateful to God Almighty for the His bountiful grace which has brought me this far. In addition, I thank Professor S. E. Owusu, for showing interest and helping me re-shape the study topic.

Sincerely, I express my utmost gratitude Dr K. B. Inkoom, Director of the SPRING Programme, Department of Planning, for guiding and supervising this work in that unique manner which opened my understanding to the issues and enabled me go the extra mile.

Also, I am thankful to my family for putting up with all the discomforts of my absence at home and giving me the support to go through this course.

I give tones of thanks to Mr Owusu-Sekyere of the School of Graduate Studies, for being there for me always. God Bless you abundantly.

An overly appreciation goes to all my lecturers of the Department of Planning, Mrs Dina Adei: my academic supervisor, Dr K.O Agyemang, Professor S. E. Owusu , Dr Imoro Braimah, Dr Nsiah Peprah, the Late Mr Annor-Anim, Dr Antwi Boasiako, Mrs Theresah Baah Ennumh, Mr ,Nana Achina, Dr K.D. Kessey, Professor Sam k. Afrane and to some course mates who shared ideas with me on this work.

Finally, I am particularly grateful to all the respondents to questions and interviews of this work, especially to the Upper East Regional Coordinating Unit and The Regional Director of the Environmental Protection Agency, Upper East Region.

LIST OF ACRONYMS

ASM	Artisanal and Small Scale Mining
ALP	Alternative Livelihood Projects
AIDS	Acquired Immune Deficiency Syndrome
DFID	Department for International Development
DTU	Domestic Tax Unit
ERP	Economic Recovery Programme
EPA	Environmental Protection Agency
GCM	Ghana Chamber of Mines
GSS	Ghana Statistical Services
GHS	Ghana Health Service
GRA	Ghana Revenue Authority
HIV	Human Immune Virus
IMF	International Monetary Fund
ILO	International Labour Organization
LMC	Large Mining Companies
MC	Minerals Commission
MDGs	Millennium Development Goals
MMSD	Mining Minerals and Sustainable Development
NGO	Non Governmental Organization
PNDC	Provisional National Defence Council
PMMC	Precious Minerals Marketing Company
RCC	Regional Coordinating Council
REPO	Regional Economic Planning Officer
SAP	Structural Adjustment Programme
TDA	Talensi Nabdam District
UER	Upper East Region
UNDP	United Nations Development Program
UNEP	United Nations Environment Programme
WAJAE	West Africa Journal of Applied Ecology
WHO	World Health Organization

TABLE OF CONTENT

CHAPTER TWO

THEORITICAL AND CONCEPTUAL FRAMEWORK

CHAPTER THREE

RESEARCH METHODOLOGY

CHAPTER FOUR

CHAPTER FIVE

LIST OF TABLES

LIST OF FIGURES AND PLATES

CHAPTER ONE

GENERAL INTRODUCTION

1.1 Background to the Study

Ghana possesses some 70 percent of West Africa's proven gold reserves. The country's geographic setting accounts for her wealth of mineral resource. The major Precambrian rock units in Ghana are the primary source of the country's major mineral products: gold, bauxite, diamonds, and manganese (Grubaugh, 2002), and they are associated with Proterozoic, Birimian rocks of 2.155ma and 2,170ma Tarkwaian rocks. The majority of gold produced in Ghana come from Birimian rocks, which constitute approximately one-third of the country's major eight belts of mineral resource, (Grubaugh, 2002).

The mining sector used to be a source of ornamental prestige to the cultural heritage of the predominantly Akan people of Ghana. However the advent of European merchants on the Gold Coast, unearthed the real potential of gold and the mining of Gold became very commercial since the beginning of the 17th century, (Aryee, 2002).

The minerals sector has made noteworthy contributions to foreign exchange earnings and Gross Domestic Product (GDP). Ghana's mining sector contributes to approximately 40 percent of gross foreign exchange earnings and accounts for approximately 5.6 percent of Gross Domestic Product (GDP) (Ghana Statistical Services) and recent figures show that, the mining sector contributed about $700m to government revenue in 2008, when the then Ashanti Goldfields was divested to the Anglogold Mining Group of Companies, (GSS, 2009).

Predominant mining regions of Ghana have for a long time been the Ashanti, Eastern and Western regions of Ghana. Even though the Upper East Region, formerly known as the North Eastern Corridor of the then Northern Territory of Ghana, was identified to have some mineral deposits like coal, manganese and gold. The first ever mining exploration in the Upper East Region was done in Nangodi in the Talensi Nabdam District but was abandoned by the Russian Miners in 1934, (Hilson, 2001).

For the past two decades however, there has emerged intensive Artisanal Small Scale Mining (ASM) activities in the region. Mining activities in the region contributed to the national ASM mining revenue of 20072, 028 (Minerals Commission, 2007). However, issues of environmental degradation and the need for the people to make a living out of mining have become contentious.

1.2 Definition of the Problem

It is a general global phenomenon that small scale mining, both formal and informal has become very vital in livelihoods of the poor. However, production methods are crude and unregulated in many cases, undercapitalized, ill-equipped and technical and management skills are lacking. Although some small scale mining is legalized and regulated under the Small-Scale Gold Mining Law, 1989 (PNDCL 218), the sector has a lager component of artisanal small scale mining which is highly labour intensive, produces erratically from locally identified and abandoned mining sites of big mining companies as the case is in Nangodi in the Upper East Region.

The crux of the matter is, artisanal mining is widely accepted to be causing environmental and health problems but largely these negative effects are overlooked

by decision makers because they see artisanal mining as a recipe to decreasing unemployment and a relief to poor livelihoods. The Upper East is the 5th most densely populated region in Ghana with a population of 920,089. The region has high poverty levels of 84 percent falling only behind The Upper West Region with 87 percent, (Ghana Statistical Services, 2008). The total land area is about 8842 sq km, which translates into 2.7 per cent of the total land area of the country (Regional coordinating Unit, UER).

Though predominantly an agricultural economy - 65.9 percent of the population engaged in agricultural activities, with proportions of 71.8 percent males and 61.2 percent females in agriculture, the region does not have all year cropping. The climate is characterized by one rainy season from May/June to September/October. The mean annual rainfall during this period is between 800 mm and 1.100 mm. The rainfall is quite erratic. There is also a long spell of dry season from November to mid February. Moreover, the region's soil is upland soil type mainly developed from granite rocks and is shallow and low in soil fertility. The soil is prone to erosion due to the shallow and coarse textured nature of the soil (Regional Environmental Protection Unit, UER, 2011).

Therefore, can the already precarious situation of erosion in the region be exacerbated by increased crude surface mining? The World Food Programme's 2010 report has it that, the silting of the main drainage of the region - White Volta, Red Volta and the Sissili Rivers is caused by erosion. And this renders the region susceptible to flooding and low crop yield - the production of millet and rice decreased by 54.2% and 30% respectively in 2009. Non Governmental Organizations have trained and equipped some people with skills in the garment,

sewing, hairdressing, bakery, mechanical fitting among others, but majority of beneficiaries fall out of business due to low market in especially rural savanna, thereby, reinforcing the low professional, technical and related work rate of 3.8 percent in the region (UE Regional Coordinating Unit, 2010). Is it therefore in this vein, that over 10, 140 people (ILO, 2007) especially women and youth of the Upper East Region and beyond, have found respite in small scale mining despite the health and environmental implications of ASM?

1.3 Research Questions

i. What are the driving factors of increased Artisanal Small Scale Mining in the Upper East Region?

ii. Are there socio-economic implications of widespread ASM in the Region?

iii. What are the effects of ASM on the Region's environment; and

iv. Can ASM become a viable means of livelihood to the people to reduce extreme poverty in the Upper East Region?

1.4 Research Objectives

The general objective of this study, was to assess why the people of the Upper East Region engage in ASM and to find out if ASM when properly regulated and supported can reduce poverty in the region.

The Specific Objectives are to:

i. Examine the causes of ASM in the Upper East Region.

ii. Analyze the effects of ASM on the socio – economic situation of the people.

iii. Assess the environmental implication of ASM to the Region and

iv. Assess the opportunities that will accrue to people of the region if government supports and applies stringent regulation in collaboration with the people.

1.5 Justification of the Problem

This study is thus justified on the following premises.

Ghana's economic structure and capacity has failed to absorb even a quarter of the teeming unemployed labour force of about 9m (GSS 2008). Policy framework has also not been able to strengthen the agricultural sector which is the base of the economy to maintain and attract the workforce. The result of this is the unemployment rate of 71.6% as at September, 2007(World Bank). Unemployment rate of the youth between ages of 18 to 44 is three times that of 45-60 and keeps increasing by an estimated number of 3.5% annually. So, do we say then that ASM is justifiable?

On the other hand, if "a livelihood comprises the capabilities assets-both material and social resources required for a means of living and it should cope with and recover from shocks and maintain the capabilities and assets both now and in the future, while not undermining the natural resource base" (Carney, 1998 page 4), then this is the common basis upon which many people condemn ASM as a means of livelihood.

Generally, artisanal mining- “galamsey” as is it popularly called, has proved to be a primary source of employment for job seekers from various parts of the country who are relatively disadvantaged in the labour market. For example the unskilled, the uneducated, women, the poor and even the disabled and according to (ILO 1999), over 4.5 million youth are engaged in ASM and over 250,000 for Ghana as at 2003 (Aryee, 2003).

Output from ASM is quite significant and makes up 9.5% of gold and 82% of diamond production in Ghana (Amankwa and Sackey, 2003). Institutional, structural and regulatory frameworks which can influence the operations of ASM for the general benefit of the economy are weak. Consequently effective government’s technical and financial support to the sector to enhance its positive impact and minimize the inimical effects on the people is lacking. More importantly, the ASM sector which has the potential to alleviate extreme poverty and help government achieve Millennium Development Goal One and some other MDGs has been tagged a nuisance.

Taking cognizance of the above raised issues, this research will delve into the income viability of ASM in connection to meaningful livelihood, savings, investment, poverty reduction, social issues of ASM, environmental and economic implications of “galamsey”- ASM.

Essentially, it will add to the body of knowledge around “galamsey” issues and help reveal the extent of loss or gain to the Upper East Regional economy.

1.6 Scope of the Study

This research was carried out in the Upper East Region – 6 communities Datoku, Yameriga, Gbane, Duusi, Pelungu and Yali. in the Talensi Nabdam District of the Upper East Region.

The study focuses on examining the socio-economic issues and environmental impact of ASM as well as its future prospects of alleviating poverty in the Upper East Region of Ghana. The period of study shall be from October, 2010 to May, 2011.

1.7 Methodology

1.7.1 Research Design

A case study approach and trend analysis was employed. In order to have an in-depth study, this method is vital. Haggett (1977) stated that a case study is an empirical enquiry that allows for an investigation of the dynamics of a particular system. The study design is the core and basic outline upon which the study rests. Therefore, cross sectional method of using the logical sequence of statement of problem, objectives, review of relevant literature, data collection procedures, analytical tool and process, interpretation and presentation of the analyzed results was used.

1.7.2 Data Sources

Qualitative and quantitative methods were used for data gathering and analysis**.** For primary data, it was obtained through interviews, discussions, community fora and participants and non-participants observation to allow informed and detailed information about the activities and effects of ASM, on the people, their communities and social make up as well as the general economy as a whole. Secondary data was sourced from the Regional Coordinating Council, the District Assemblies, mining companies, The Mineral Commission, Ghana Statistical Services, The Environmental Protection Agency among other relevant institutions, and on the internet. Extensive review of related issues in the news, journals and publications has been done for relevant information to enrich the study.

1.7.3 Data Collection Instruments

The data collection techniques consist of semi-structured and structured questionnaires, forum and interview guide. These instruments have enhanced and facilitated the data collection procedures.

1.7.4 Sampling Techniques

The study used the multi stage sampling technique. The sampling techniques include the purposive sampling method in the determination of institutions and self-help groups and associations interviewed and the random sampling technique was employed in the selection of the various beneficiary households contacted. The purposive sampling is used when the various sampling units satisfy certain criteria of interest while the random sampling technique is employed when there is the need to ensure fair representation of the sampling units.

Although the study partly used forum to elicit information from the community members, the mathematical approach in the determination of the sample size of the community members to be involved in the research was determined by the mathematical sampling approach given by Miller and Brewer (2003) which was used is stated below:

$$n = \frac{N}{1 + N(\alpha)^2}$$

Where n = sample size

N = Sample frame

α = margin of error

The sample frame (N) shows the list of the population of the communities to be selected for the study. The sample (n) is then calculated out of the sample frame (N).

1.7.5 Data Analysis

In understanding the key concepts of the study, the data collected was analyzed. Empirical data collected was processed by editing in order to do away with data errors. Detailed descriptive narration and write ups has been used for elaborations

1.8 Organization of Study

The study has been specifically organized into five chapters; background to the study is in chapter one, highlighting on the problem statement, research questions, objectives and the scope of the study. In Chapter two, focus was on reviewing existing literature, relevant to the study. It examines the definitions and explanations of concepts. The chapter serves as a guide and sets the tone for appreciating the analysis of the empirical data collected.

The methodology employed for the research and the profile of the study area have been captured in chapter three of the research. This chapter explains the methodology used. The analysis of data has been done in chapter four and finally chapter five contains the findings, recommendations and conclusion.

CHAPTER TWO

THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1 INTRODUCTION

So much research has gone into the mining sector in the developing world where mining although is seen as a remedy to revenue needs and source of livelihoods, has also been discovered to be the cause of tremendous mishaps to the environment and human beings. Based on their findings 2002, the World Bank Group led by James Bond, titled the report of their study on Mining In Developing Countries including Ghana as, "Treasure Or Trouble," (Bond, 2002)

This chapter therefore, explores existing literature on experiences on poverty, livelihoods, the environment and Artisanal and Small Scale Mining in the developing world. The review extends to the broader issues around ASM in Ghana and other developing nations and finally analyses extensively, the issues as they pertain in the Upper East Region of Ghana. Focus was given to different perspectives of ASM by different writers and researchers, the potentials or any success stories of ASM , the concepts of ASM, existing laws and policies on ASM as well as unearthing whether there are any exigencies for ASM in the face of extreme dehumanizing poverty and livelihoods.

2.1.1 The Concepts of Poverty and Livelihoods

Poverty is the state of lacking basic necessities and absolute Poverty is the lack of basic human needs, such as clean and fresh water, nutrition, health care, education, clothing and shelter, because of the inability to afford them. About 1.7 billion people in the world live in absolute poverty and the 30 poorest countries of the world, 21 are

in Africa (World Bank, 1995). The UN's World Summit on Social Development in 1995, the 'Copenhagen Declaration' by 117 countries including Ghana, described absolute poverty as "…a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information." And that it depends not only on income but also on access to services. At this summit, the programme of action had eradication of 'absolute' and reduction of 'overall' poverty as one of the core actions.

Overall poverty takes various forms, including;

- lack of income and productive resources to ensure sustainable livelihoods
- unsafe environments and social discrimination and exclusion,
- lack of participation in decision making,
- loss of livelihoods as a result of economic recession,
- sudden poverty as a result of disaster or conflict,
- The poverty of low-wage workers and the utter destitution of people who fall outside family support systems, social institutions and safety nets (UN, 1995).

Absolute poverty measures however set a 'poverty line' at a certain income amount or consumption amount per year, based on the estimated value of a 'basket of goods' (food, shelter, water, etc.) necessary for proper living. Therefore the World Bank sets poverty at an income of $2 a day or less, and extreme or absolute poverty is set at $1 a day or less. (UN, 1995).

From the distinctions drawn between poverty and absolute poverty, it is quite clear that poverty has levels and depending on the level, its impact too on the human being varies. Clearly a poor person in the developed world like USA, at least has access to

clean water, government homeless shelters, health insurance, coupled with unemployment allowance and other amenities cannot be compared to a developing world poor person who is compelled by the absence of any social safety nets to live on the streets, in a hut or leaking mud house which can un-roof or fall at the least weather upset, who laboriously crops the land at the mercy of the natural rainfall which often fails, lacks treatment of simple illnesses, drinks unclean water and has difficulty leaving his hut environment to even the next village or town due to lack transport of fare, bad roads or even lack of a plying vehicle from his abode.

2.1.2 Vulnerability, Deprivation and Poverty

According to Thorbexk, (2005) to be vulnerable means one to face risks that are beyond the means of one taking measures to curtail the risks involved. In other words it is the situation of uncertain and uninsured risks that one could face. In the developing world, the dominant risk faced by especially rural agrarian people is the risk natural occurrences such as drought, flooding, pests invasion, illness and death of a major bread winner of a family.

Deprivation on the other hand expresses the denial of a system or environment to offer equal opportunities upon which poverty can be low. For example, lack of educational and health facilities in a community can be a deprivation which can further deepen poverty. Again, international inequalities established by unfair trade terms and imperialism are a clear example of a broader form of deprivation. The developing world pays the developed world $717 million in debt servicing alone every day and every child at birth, owes $482 a day. (Romolu 2004, page 6). Consequently, poverty which is an economic security issue worsens when there are barriers to equal opportunities in a country and across countries especially, in trade

terms. Therefore, any means of measuring poverty should allow for the assessment of the aspect of vulnerability and deprivation. Another usefulness of the considering these attributes of poverty is need to firmly integrate them into policies and programmes meant to alleviate poverty.

2.1.3 Poverty levels in Ghana

The Population of Ghanaians below the poverty line as described by the UN is 28.5 percent and the nation ranks 75 in the world as far as poverty levels is concerned (2007 est.) However, the Ghana Living Standard Survey has revealed that, extreme poverty fell from 27 percent to about 18 percent in the same period (Ghana News Agency, 9th Feb, 2010).

Table 1 Population of Ghanaians Below Poverty Line:

Year	Population below poverty line (%)
2000	31.4
2001	31.4
2002	31
2003	31.4
2004	31.4
2005	31.4
2006	31.4
2007	31.4
2008	28.5
2009	28.5

GSS, 2010

2.1.4 Livelihood

Livelihood on the other hand, is a means, activities, entitlements and assets by which people make a living, which is immediate and continuous. It is also a framework that seeks to build the capacity of people to continuously make a living and improve their quality of life without jeopardizing the livelihood option of others, either now or in the future by coping and adaptive strategies (Aubynn, 2004; Labonne and Gilman, 1999). Another definition is: "A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when "it can cope with and recover from stresses and shocks." Chambers and Conway (1991).

According to Sen, capability measures the freedom to achieve alternative functioning. To function as an individual therefore, demands some basic requirements. The unique and real determinant of attaining a level of functioning and choice making is income and the logic and rationale behind the money-metric approach to poverty is that, in principle, an individual above the monetary poverty line is the one who possesses the potential purchasing power to acquire the bundle of attributes yielding a level of well-being sufficient to function and make choices.

This is why the multidimensional base of poverty makes it extremely difficult to configure the components into real situations facing real poor people. For instance how do we deal with the abstract and almost illusionary poverty dimensions of freedoms, exclusion and access to information and the corporeal issues such as hunger and lack of shelter which are directly linked to income (Livelihood). This notwithstanding, a declaration that the real elements of survival and sustaining life

which are access to food, clothing and shelter and which are directly linked to means of income or livelihood take precedence over all other dimensions of poverty, is uncontestable.

Moreover, the various contexts within which most people in developing countries earn their means of livelihood render them more vulnerable. Such contexts include economic, social and environmental factors. A farmer may work extremely hard to earn his livelihood but can loose it to the rigours of the weather such as drought and flooding. The market under which the poor person produces can be highly unpredictable and can offer very low prices to the poor person's produce and even push him into debt. This is especially of economies that allow the free market to allocate resources and this is why the DFID sustainable livelihood approach should have emphasized the component of market influence.

2.1.5 Sustainable Livelihood

The term 'sustainable livelihood' came to prominence as a development concept in the early 1990s, drawing on advances in understanding of famine and food insecurity during the 1980s Chambers and Conways (1991).

The Department for International Development's Sustainable Livelihood Approach:

The December 2000 DFID conference in Kathmandu sought to address striking issues of livelihood on the six main principles of the sustainable livelihoods approach - people-centered, responsive and participatory, multi - level, conducted in partnership, sustainable and dynamic linked as a framework and conceptual tool for understanding the context in which people make a living (Dorward, 2008).

The Six Sustainable Livelihood Models

- People Centered: sustainable poverty elimination will be achieved only if external support focuses on what matters to people, understand the differences between groups of people and work with them in a way that is congruent with their current livelihood strategies, social environment and ability to adapt.
- Responsive and participatory: poor people themselves must be key actors in identifying and addressing livelihood priorities. Outsiders need processes that enable them to listen and respond to the poor.
- Multi-level: poverty elimination is an enormous challenge that will be overcome only by working at several levels, ensuring that micro-level activity informs the development of policy and an effective enabling environment, and that macro-level structures and processes support people to build upon their own strengths.
- Conducted in partnership**:** both the public and the private sector.
- Sustainable: There are four dimensions to sustainability - economic, institutional, social and environmental sustainability. All are important and a balance must be found among them.
- Dynamic; external support must recognize the dynamic flexibly to changes in people's situation, and develop longer-term commitments.

SL approaches are underpinned by a commitment to poverty eradication**.** Although they can in theory, be applied to work with any stakeholder group, an implicit principle for DFID is that activities should be designed to maximize livelihood benefits for the poor.

As Carney (1998) explains at length in the following passage: “A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living”. It is considered sustainable “when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base”

2.1.6 Alternative Livelihood Projects

Alternative livelihood concept emerged out of frantic efforts by stakeholders in the mining sector to curb artisanal and small mining which has been declared a major hazard to the environment and the smooth operation of Large Scale mining. AL interventions include projects that are basically aimed at compensating and re-establishing those who have been relocated or adversely affected by mine activities. ALs are basically defined as projects or activities not relating directly or linked to the mining industry (Afenu, 2006 cited in Temeng & Abew, 2009). As much as possible, activities offered by the large mining companies were grass cutter and snail rearing, textiles, farming, and so on which were meant to get community members off the backs of the mining sector.

Many of the interventions meant to offer sustainable livelihood to people affected by mining activities were not wholly successful due to the following reasons:

- Lack of adequate due diligence to assess the risks, assets and livelihood systems of the community.
- Lack of understanding of community needs, skills and experiences which affects project appropriateness.

- Inadequate community involvement and participation throughout all stages of the project.
- Inadequate understanding of the market dynamics leading to poor marketing of products.
- Lack of funding and sustained interest beyond the initial stages of support (Temeng & Abew, 2009).

2.1.7 Barriers to Successful Implementation of ALPs in Mining Communities

Many mining companies in Ghana have or are starting to implement ALPs. The success of these projects would serve to provide a socially acceptable compromise to the challenges posed by the mining industry on mining communities, which will make the communities sustainable after mine closures. Stakeholder opinions indicate that some of the possible flaws in project development for ALs that may lead to project failure are: a large project start-up gap, the psychological perceptions of those involved, project concept generation and project appropriateness and targeting.

2.1.8 The Environment

The environment is the surrounding. It could be a physical element - physical environment that includes the built environment, natural environment - air conditions, water, land, atmosphere etc or it could be human or social environment - people surrounding the item or thing. The environment is a dynamic entity. It often is 'not' but 'becomes' and elements and beings around it are its principal shapers. It is shaped by institutional, technological and socio-economic factors although, natural phenomenon plays an important role in what the environment is today and can be tomorrow.

According to the United Nations International Strategy for Disaster Reduction, environmental degradation is "The reduction of the capacity of the environment to meet social and ecological objectives, and needs" (UNEP, 1995). Environmental degradation therefore has unlimited consequential results. When natural habitats are destroyed or natural resources are depleted, the environment is degraded. The immediate results of environmental degradation are pollution of air and water bodies, deforestation, global warming, unsustainable agricultural and fishing practices among others, whilst the overreaching consequences include, increased poverty, overcrowding, famine, weather extremes, species loss, acute and chronic medical illnesses, war and human rights abuses.

The United Nations Environmental Programme associates poverty in Africa with the massive environmental degradation going on in Africa. According to the UN body, rapid population growth without a corresponding economic growth especially those of Sub Saharan Africa is responsible for deforestation, water pollution and siltation, overgrazing and erosion of farmlands and sand and mineral mining related pollution and degradation (UNEP, 1995). Natural resource degradation further puts the poor at risk. This is because their productivity will be reduced, and weather extremes will be more harsh on them.

Furthermore, Professor Jeffrey Sachs, of the United Nations concluded, "Quite simply, Environmental Sustainability is the foundation upon which achieving all the other MDGs must be built" and that the "environment is the golden thread, the red ribbon, running through and round all the Goals" (Sacks, 2007).

In the developing world, lack of industrial openings in the rural settings has rendered people totally dependent on the natural environment. Women hue growing trees for

wood fuel and chacoal burning, men cut trees manually with chain saw machines, drag the logs and destroy, growing trees in their trail, and finally utilising only 15% of the logs. Over grazing and destruction of farmlands by nomads, shifting cultivation and bush burning coupled with a new increased phenomenon of small scale mining increasingly polluting and silting water bodies, rendering once fertile farmlands barren and highly eroded. Irrespective of the alarming impact of human activity on the environment, there is often resistance with scientific and formalised policies and programmes to save the environment. Reasons often put forth by resisting groups point to the fact that, they would not go hungry in the midst of God given plenty in the name of environmental protection. Perhaps, the science and engineering dominated methods of curtailing environmental degradation should be complimented by analysis of traditional values, social and economic situation of the people in order to have an acceptable and sustainable environmental policies (Walde 1992).

Ghana has not relented in her efforts to deal with environmental issues and to this a number of policies have been enacted which include:

I The National Environment Policy 1995, Reviewed and approved (2007)

Ii National Wetlands Policy (Strategy, 1999)

iii Food and Agriculture Sector Development Policy (FASDEP) MoFA in 2002,

iv Tourism Development Act, 2011 (ACT 817)

v Land Management Policy (LAP, 1994)

vi National Health Policy (2008)

vii Energy Policy (2010)

viii Minerals and Mining Policy (Act 703)

ix Wildlife Conservation Policy (NRMP , 1999- 2000)

In addition to these policies are some important regulations:

i The Mineral and Mining Law, 1986 (PNDC 153)

i. Rivers Ordinance, 1903 (Cap 226)

ii. Land Planning and Soil Conservation Ordinance No 32 of 1953 as Amended by the Land Planning and Soil Conservation (Amendment) Act, 1957 (No. 35 of 1957)

iii. Maritime Zones (Delimitation) Law 1986 (PNDCL 159) urban planning and development (Amlalo, 2004).

2.2. Mining

Mining is the removal of minerals from the earth's crust in the service of man (Down and Stock, 1977 cited in Acheampong, 2004:1). The Encarta encyclopedia also defines mining as the selective recovery of minerals and materials, other than recently formed organic materials from the crust of the earth (Encarta, 2005). The Oxford dictionary defines mining as the process of getting coal and other minerals from under the ground.

2.2.1. Legislative overview of mining in Ghana

The legislative framework for mining in Ghana is laid down in the Minerals and Mining Law, 1986, PNDCL 153 (Law 153) as amended by the Minerals and Mining Amendment Act 1993, Act 475 (Act 475) and modified by the provisions of the Constitution of 1993 (the Constitution) and amended again in 2006. Within this legal framework,

- The State is the owner of all minerals occurring in their natural state within Ghana's land and sea territory, including its exclusive economic zone.

- All minerals in Ghana are vested in the President on behalf of and in trust for the people of Ghana. Thus, regardless of who owns the land upon or under which minerals are situated, the exercise of any mineral right requires, by law,
- a license to be granted by the Minister for Mines (the sector Minister) who acts as an agent of the State for the exercise of powers relating to minerals.
- Mineral rights are legally defined to include the rights to reconnoiter, prospect for, and mine minerals.
- The sector Minister is also authorized to exercise, within defined limits, powers relating to the transfer, amendment, renewal, cancellation and surrender of mineral rights.
- The powers conferred upon the Minister must be exercised contingent upon the advice of the Minerals Commission (MINCOM), which has the authority under the Constitution to regulate and manage the utilization of mineral resources and co-ordinate policies in relation to minerals.
- Law 153 specifies the forms of mineral rights that the sector Minister is empowered to grant, the duration of the grant, the size of the concessions, and eligibility criteria for the grantee, as well as the procedure for application for mineral rights. The Law also spells out in broad terms the rights and obligations of a holder of a mineral right and the terms and conditions upon which each mineral right grant should be made.
- A mineral right granted is not transferable or tradable in any form except with the prior written consent of the sector Minister.

2.2.2 Distinction between Artisanal Mining and Small Scale Mining

Artisanal miners mine gold and other minerals from deposits that are not reached with sophisticated geological technology. It is undertaken using very basic tools in different forms, along mineral rock belts, in rivers and streams, and in pits which have been exploited and abandoned by large-scale mining companies. In Ghana, ASM is called "Galamsey", in neighboring francophone countries, such miners are called *orpailleurs* and In Brazil, they are called *garimpeiros*.

Although some small scale miners seek permit and small concessions, the sector is highly shrouded in illegality since majority of them operate on the basis of ancestral ownership of the land, mutual agreement with land owners and mostly shear neglect of processes and laws with claims of being denied traditional livelihood because their lands have been annexed by government in collusion with large mining companies (MMSD, 2002).

"In the 1980s, a host of conferences largely sponsored by the United Nations made it a primary goal to draw distinctions between artisanal mining and small scale mining. 'At what point does 'artisanal mining' become 'small-scale mining'? When does a small-scale mine become a 'medium scale mine'? These questioned lingered on in spite of genuine attempts at differentiating the two lower level mining sectors in order to make policy initiatives on them easier and applicable. The problem persisted across languages: In French the difficulty was defining between *'les operations artisanale, semi-industrielle et industrielle',* until the illusionary task became evident and countries then devised definitions which are unique in their various economic, social, technological and cultural perspectives.

In Burkina Faso and Ghana for example, determination is by level of mechanization and concession acquisition, in Senegal and Ethiopia, it is by depth of work and production levels where as in South Africa, it is by level of capital investment.

However, the dominant distinction between artisanal mining and small scale mining is that, artisanal mining involves individuals or groups and it is purely manual, and small-scale mining, is more extensive and usually more mechanized. Another clear distinction is in the nature of their rights to the land. In some instances, small-scale miners have legal title to the land that they work on, which is recognized by the state and community leaders. In other cases, they work on lands they have traditionally inhabited but without any recognition of land rights from the state, or they may be exploiting the land informally and are regarded as illegal squatters by local and state authorities. Between the two groups, artisanal miners are more likely to be working without legal mining title. But artisanal and small-scale miners also share wide similarities than differences and largely speaking both;

- Are labour intensive and are prone to injuries and death,
- Lack capital and equipment,
- Work in hazardous conditions very detrimental to their health,
- Exploit small and abandoned mineral deposits,
- Have minimal marketing advantages and often do not recover cost,
- Degrade the environment,
- Use children.

It is quite a certainty that artisanal and small-scale miners degrade the environment with a greater environmental cost per unit of output, than those working in large mining enterprises (Lombe, 2003). Since their operations are often subsistence

activities, small-scale miners tend to focus more on immediate livelihood concerns than the long-term consequences of their activities, compounded by lack of awareness particularly of the scientific sophisticated invisible long-term environmental impacts of ASM activities, lack of information about affordable and best practices to reduce negative impacts and in many cases, governments failure to make these a focal part of policy.

2.2.3 History and Policies on ASM in Ghana

Artisanal gold mining in Ghana has a long history, spanning 2500 years (Hilson, 2002a). According to Agyepong (1987), farmers have mined gold during slow agricultural seasons for centuries, and that, commercial scale gold mining is believed to have begun in Ghana in the early 19th century by the British. Other records indicate that ASM was practiced as early as the 4th century and the indigenous population of Ghana got more involved when the Europeans arrived in 1471. In spite of the passing of a law against the use of Mercury in 1933, ASM continued to make use of mercury as a main chemical agent in gold extraction.

The Provisional National Defence Council Law 218 of May 1989, (PNDC Law 218) gave significant recognition and room for ASM activities. Although this law with its incentives packed provisions like, 5 percent investment allowance, 75 percent capital allowance and 50 percent on declining balance, 90 percent external account retention among others, was to enable Ghana attract foreign mining companies to invest in the mining sector, the accompanying Precious Minerals Marketing Corporation Law, 1989 (PNDCL 219) was mainly enacted to develop the ASM sector through purchasing minerals from ASM miners. Many youth, returnees from Nigeria and especially retrenched workers of the IFM economic remedy policy of 1983:

Structural Adjustment Programme, took advantage of this and gained their livelihoods through ASM, thereby providing employment opportunity to more than a million Ghanaians (Tsikata 1997; Akabzaa & Dramani, 2001).

Due to the fact that ASM activities are mostly prevalent in the remote hinterland removed from the so called government seat and other important cities, not much attention is accorded it. Compared to the agricultural sector, ASM has been viewed marginal and a nuisance especially in relation to environmental degradation and the cohort actions against multinational large scale mining companies who are perceived to be of financial benefit to the state. (Bugnosen, MMSD, 2007).

Chachage (1995) espouse that the spurt in ASM can be attributed to the World Bank structural adjustment programme prescription for most African countries, which created teeming unemployment, through cuts in jobs. Also the sector, strategically grew when large scale mining industries abandoned their concessions in African countries in the face of deep financial and economic crises in the 70s and 80s (Addy, 1999).

Enactment of policies and laws for small-scale mining, has not yet played significant role in shaping the universal downturns of activities of ASM and Ghana is no exception.

The 2006 Mineral and Mining Laws of Ghana, Act 703, is quite shallow in outlining the procedures and regulations and development of Small Scale Mining. For example, from sections 83 to 99 which is devoted to ASM,

- no specifications and limits of land area and closeness or otherwise to water bodies is mentioned.
- All powers of offering concession is vested in the Minster through the District Mineral Commission Officer. This means, people of a land would be there and only see their land being mined and can be a recipe for apathy and indifference of the people toward any degradation by a miner. Even the a whole traditional area has just one representative on a District Mining Committee.

Section 92 sub section 1 has it that,

1. There is established in every designated area a Small Scale Mining Committee.
2. The Committee consists of the following members:

the District Chief Executive or the representative of the District Chief Executive who shall be the chairperson of the Committee;

3. The District Officer appointed under section 90(2);
4. The person nominated by the relevant District Assembly;
5. The person nominated by the relevant Traditional Council;
6 An officer from the Inspectorate Division of the Commission; and
7 An officer from the Environmental Protection Agency

A new legislation by Central Kalimantan in Indonesia which yielded result for a while and started to fail was called "People's Mining" had the following content:

- The area that a people's mining permit gives to an individual may cover a maximum of 5 (five) hectares and a cooperative may be provided with a

people's mining permit covering an area of maximum of 25 (twenty five) hectares and shall be done in collaboration with community heads.

- An individual that has already had a people's mining permit is no longer allowed to have another permit unless his or her previous permit has expired [or is no longer effective].
- A people's mining area shall be situated on land and shall be at least 200 meters away from the bank of a river.

Although the law had quite a sharp edge which could minimise some ASM concerns, it became impotent because there had not been any interactions between officials and ASM practitioners nor any support programmes like education and training on the law. Legitimate concerns such as many miners do not know where and how to apply for a mining license, the law being excessively bureaucratic, excessively complicated especially on environmental issues, licenses being expensive or sometimes the law requiring higher levels of sophistication in mining methods and no assistance or training services available, were not attended to. Rather, official interactions come only reactively towards infringement of the law or when hostilities arise between ASM and LMC. Consequently military and police clampdowns have become common and studies indicate how these force measures rather deepen apathy towards issues of the environment among ASM operators.

In October, 2006, the government of Ghana under the influence of the Chamber of Mines, used the army to clamp down ASM operators from Preastea in the Western Region, Obuasi in the Ashanti Region to Noyem in the Eastern Region. The operation, which was coined *Fight Against Illegal Mining*, was financed by the country's chief large-scale mine operators. Virtually all the 'galamsey' belts in Ghana were attacked and closed down but that was just for a while and now ASM is

in full bloom all over the country again and even springing up in new areas like the Brong Ahafo and the Upper East Region.

The gaps between the miners, officials and policy on paper and the realities on the ground, is one major setback on efficacies of laws meant to deal with grave issues which concern the degradation of the environmental and other concerns like child labour.

2.3 Socio-Economic Implications of ASM

As Davidson (1993) elaborates, it is a United Nations report, Small Scale Mining in Developing Countries in 1972 that put small scale mining in the limelight as an industry. According to him, the report brought to the for the first time, the economic importance of small-scale mining by digesting global trends in ASM, and that, five major international meetings have since taken place in: Jurica, Mexico (1978); Taxco, Mexico (1981); Helsinki, Finland (1983); London, UK (1987); and Ankara, Turkey (1988), as well as two important regional seminars in Mombasa, Kenya (1980) and Calcutta, India (1991), of which all were devoted to discussing and analyzing the problems and the prospects of small-scale mining.

Fundamentally, the discourses at these meetings delved into health and environmental matters of ASM and more strategically, looked at factors that have overshadowed the important socio-economic contributions of the sector and in 1993 after a meeting in Harare, Zimbabwe, the socioeconomic importance of the industry was finally etched in stone on the following:

- The potential business benefits of small-scale mining outweighed its negative aspects;

- Small-scale mining was a motor driving entrepreneurship; and
- Equipment needed by small-scale miners could in fact be manufactured in developing countries (Labonne, 1994).

By and large it had become quite clear to the world body that in spite of the uniform mode of operations of ASM miners from one region to the other, one country to the other, the sector basically, has very distinctive common features such as being semi mechanized, hostile to the environment and most importantly, being a poverty driven industry and policy formulation will not be affected without establishing clear definitions for the an almost twin industry. Focus then shifted from efforts at establishing different definitions and categorizing artisanal mining and small scale mining to technical and finally to livelihood concerns. The journey of discussions on ASM by the UN is spelt out in the Table 2.

Table 2: Periods of UN Discussions on ASM matters

Period	Focus
1970s	Definitional issues.
1980s	Technical issues.
Early 1990s	Towards integration of technical, environmental, legal, social and economic issues.
Mid 1990s	Special attention on legalisation of ASM sectors
Late 1990s	Relation between large mining companies and ASM; Gender and child labour issues
2000s	Community related issues and sustainable livelihoods

Source: MMSD, 2007

The use of the livelihoods approach, or at least the principles underpinning it, is now recognized as an important planning tool for poverty reduction in the ASM sector, especially in the developing world.

2.3.1 ASM, Employment and Livelihoods

About 3.9 billion people live in today's 56 mining countries, 90 percent of them in the 51 developing and transition countries. Among the 3.5 billion people in these countries, about 1.5 billion live on less than $2 a day, making up nearly two thirds of the world's poorest population (James Bond, World Bank Group on Mining, 2002). Small-scale mining in developing countries provides employment for an estimated 13 million people (ILO, 1999).

Incomes earned by ASM workers, compared to available rural occupations like farming is higher. Avertedly, farmers, construction workers, retailers and retrenched workers even from the urban hood have found respite in ASM and this has minimized rural urban drift. The employment ASM offers, has also helped lower crime and suicide rates of impoverished rural agricultural farmers (Amegbey, Dankwa and Al-Hassan, 1997).

In Ghana, an estimated 24,000 rural jobs have been created as a result of small-scale gold mining alone (Amegbey *et al*.,1997). The World Bank estimates in 1995 stood at 30,000, with the Minerals Commission and the Ghana Chamber of mines noting that 60 per cent of the country's total mining labour force is employed in small-scale mines (Hilson, 2001).

2.3.2 Production Levels and Foreign Exchange of ASM

The often large numbers of people involved in ASM means that on a national scale total production can be significant – in some cases equaling or exceeding that of large mines. According to the International Labour Organization (ILO), in recent years artisanal and small-scale mining accounted for 15–20% of the world's non-fuel mineral production. The importance of small-scale mining for different minerals varies between country and sector. It accounts for the vast proportion of gemstones (90–100% in most countries) and diamonds (80–100% in countries that are not major producers). In China, ASM produces 75% of the bauxite. In Indonesia, the total production of tin by small-scale miners equals that of large-scale production. And in Ghana ASM is estimated to produce 60–70% of the diamonds.

In sub Saharan Africa, regularizing ASM activities has increased gold extraction by the sector to over $1 billion worth of gold each year (Noetstaller, 1995).

Table 3: Yearly Gold Production from ASM.

Year	Small-Scale Gold Production (oz) In Ghana
2000	2,457,152
2001	2,381,345
2002	2,236,833
2003	2,274,627
2004	2,031,971
2005	2,138,944
2006	2,342,722
2007	2,628,290

Source: Ghana Minerals Commission 2008

ASM also makes a valuable contribution to foreign exchange earnings in countries where the minerals are exported (ILO, 1999). As Hentchel *et al*. (2002) explain, at the macro-economic level, production of high-value metals and gemstones, for instance, are more or less standard "currency", the produced value equivalent to additional foreign income. In Ghana, for example, over US$300 million in gold has been collected from small-scale miners since legalization of the industry in 1989. In Indonesia, a thriving small-scale gold mining sector comprised of some 77,000 operations generates a combined US$58 million in earnings annually (Hollaway, 1997).

"The most direct economic influence of small-scale gold mining has been on the foreign

exchange reserves. In 1994 the Central Bank of Suriname in an effort to increase the country's foreign exchange reserves decided to buy gold. About 800 kg of gold was bought that year and 3000 in 1995, estimated to be about 25% of total production. With the gold purchase operation the Bank was able to stabilise the economy and the Surinamese guilder appreciated more than 50% against the US dollar in one year.

2.3.3 Multiplier Effects and Investments in ASM

If employment and income figures are extrapolated, it can be estimated that up to 100 million people worldwide could depend on ASM for their livelihood (ILO, 1999: 6). The greatest benefits at the local level attributed to ASM are therefore likely to be those related to the generation of new economic linkages or multiplier impacts within the local economy (Hentschel et al., 2002; ILO, 1999; Tan Discovery. As explained by Hentschel et al 2002, small-scale mining communities

are – with few exceptions – located in remote rural areas, where they constitute the principal source of economic activity, create complementary opportunities for national micro-, small- and medium size enterprises, and provide the required infrastructure to the miners and their families. There is potential in these areas for small-scale mining in these areas to have a domino effect on the local economy, with revenues being reinvested locally. This often includes food and water, accommodation, services (including transport), and luxury items. The sector has the potential to generate significant local purchasing power and create demand for locally produced goods and services (food, tools, equipment, housing and infrastructure).

However, there are questions regarding the nature of many ASM operations and the extent to which these new economic linkages will prove sustainable once activities decrease or cease in an area (Labonne, 2002).

The extent to which ASM returns are effectively invested in creating more secure livelihoods is dependent on a number of factors including the distinctions of Weber-Fahr *et al* 2002, of the underlying drivers of participation in the sector. Weber-Fahr et al have differentiated small-scale mining on the basis of maturity and the driving motivation for participation in the sector.

They identify four categories:

- Permanent;
- Seasonal;
- Rush; and
- Poverty-driven.

These categories can be overlapping (i.e. poverty may drive permanent, seasonal and rush mining) but nonetheless form a useful typology. There is some evidence, albeit limited, that miners invest the income accrued from activities into additional mining, agriculture, and the hotel industry and service sector (Mwaipopo *et al*., 2004). Where this does not occur, it may be for the following reasons:

- With 'rush' activities, a culture of consumption often develops around the mining, preventing productive investments in the local economy (Walsh, 2003).
- Where ASM operators are migrants there might be limited incentive to invest in an area in which they have no permanent stake. They might, however, be inclined to invest in houses or capital in their own place of origin.
- Where poverty-driven ASM is undertaken on a subsistence basis and as a safety net. Labonne argues that there is unlikely to be the opportunity to save and invest in productive ventures (Labonne, 2002).

In Ghana, the government invested a modest US$1.4 million to build regional buying stations that pay world prices to small-scale miners for their gold, and established district licensing centres. The move has resulted in the collection of over US$140 million in revenues that would have otherwise been lost (Labonne, 1996), and by the early 1990s, had contributed to well over US$70 million in foreign exchange earnings for the government (Davidson, 1993).

2.3.4 Inflation

Localized inflation brought about by the activities of ASM due to newly acquired high purchasing power of those involved in mining, plunged those who are not involved in ASM into lower living standards. For example a farmer or a teacher in an ASM community will have to adjust with a static income value in the face of escalating inflation brought about by ASM operations. Their high incomes over others and the resultant economic hardships breed social problems such as crime, increased levels of substance abuse as well as prostitution and high exposure to HIV/AIDS are common.

In addition, increased pressure on local services, such as water provision and health, which are already scarce at best in many remote rural areas of the developing world, poses sanitation and health problems. (Heemskerk, 2002).

2.4. ASM and Large Mining Companies

The relationship between ASM and Large Mining companies is totally surrounded by mistrust, suspicion and hostility. Overtures from LMC are considered insulting to ASM operators who think such intensions are just to get them off the concessions of LMC and into jobs they consider menial and with very low incomes such as animal rearing, crop farming, and so on. Conflict is therefore rampant between LMC operating within approved and formalized system and ASM miners working without legal permits and often on LMC lands. Moreover, ASM miners feel disadvantaged in accessing land and financial support for their kind of operation since preference is accorded LMC in collusion with government. Such perceptions only deepen hostility which often leads to clashes, vandalism and deaths.

2.4.1 Women, Children, Poverty and ASM

Available statistics reveal the extent to which women are impoverished in the developing world. Women play a relatively small part in large-scale mining but are frequently involved in small scale Operations. In Bolivia, for example, women account for around 40% of the ASM work force; in Madagascar, Mali, and Zimbabwe, the proportion is 50%; and in Guinea, the figure is 75%. Moreover, women may be predominant in particular parts of the industry: in the Gaoua region of Burkina Faso, for example, the exploitation and selling of gold has traditionally been a female-only activity based on Mining Mineral and Sustainable Development commissioned studies, which summarizes the extent of women's involvement in selected countries.

Table 4: Number of Women engaged in ASM in selected countries

Country	**Number of Women**	**Proportion of Women** %
Bolivia	15,500	22
Burkinafaso	45,000–85,000	45
Ecuador	6,200	10
Ghana	89,500	45
India	33,500	7
Indonesia	10,900	10
Malawi	4,000	10
Mali	100,000	50
Mozambique	18,000	30
Philippians	46,400	25
Papua New Guinea	12,000	20
South Africa	500	5
Tanzania	137,500	27
Zambia	9,000	30
Zimbabwe	153,000	50

Source: Mining Mineral and Sustainable Development) country studies 2010,

In the 19th century, women in the developing world do not only do supportive work of washing and pounding ore and subsidiary jobs of selling food and water to miner in ASM, but own mine pits of their own or are buyers of extracted minerals. Although majority of women do not actually handle mechanical mining equipment, they manage their pits and machines quite efficiently than those run by men and this is amidst of difficulties in accessing legal, financial and technical support. These thrives are achieved in the midst of prejudice emanating from traditional, cultural and gender issues, In Zambia, for example, one of Africa's most prominent women mine owners reported: 'People believe that a woman should not venture near a gemstone mine because the spirits of the stones would be disturbed and the stones will burrow deeper into the earth'. ((Bugnosen, MMSD, 2007) and according to Garvin Hilson, 2002, Ghanaian women in ASM constitute 6 percent licensed buyers, 10 percent concessional holders and 20 percent sponsors of work groups.

Mining Minerals and Sustainable Development report 2007, by Bugnosen, has it that, female ASM operators are highly likely to spend their incomes on improving lives of their households than their male counterparts who will mostly gamble, abuse drugs and engage prostitutes with their incomes.

In **Ghana**, children as young as 14 years have been diagnosed with advanced stages of silicosis from grinding, washing and sieving gold ore. But the almost total lack of access to health care makes it impossible to gauge the extent of occupational diseases, especially silicosis and mercury poisoning (Geneva, ILO News, 1999).

Poverty is the driving force for child labour in mining. In most African countries, children who work in mines are bread winners of their families. Child miners

graduate from breaking, pounding, washing and sieving of ore to working underground. Since the bodies of children are small and flexible enough to penetrate the smallest of holes and pits, child miners are called ‘snake boys’ in Tanzania.

Children in mining suffer physical, psychological and emotional abuse. Most of them gradually fall out of school and those who stay in school do get very poor results which end their academic pursuits, ostensibly due to absenteeism (Appiah 1998; Aryee 2003).

The ILO convention 182 on Worst Forms of Child Labour makes child labour illegal in countries who have ratified it and Ghana is one of the 113 countries who have ratified this 1999 convention (ILO, 2001). Subsequently Ghana’s Children Act prohibits worst forms of child labour.

2.4.2 The Environment and ASM

Soil which is part of the earth surface upon which food crops and others are grown is highly affected by mining activities. Mining and metallurgical industries cause soil degradation notably through their open mining pits, gangue minerals depots and flotation tailing ponds. Leaking flotation tailing ponds have been responsible for considerable destruction of fertile soils. Sulfur dioxide emissions have caused erosion, high acidity of soils and destruction of vegetation. (UNEP, 2010).

The ecosystems of the environment is highly threatened by increased ASM activities. Mangroves and Wetlands are not spared by miners all over the globe, so far some minerals can be found howbeit small or large deposits. The United States

has lost at least 54 percent of its wetlands and European countries have lost up to 90 percent of their wetland ecosystems.

Annually, about 450 tones of mercury is released into the atmosphere by South America, Russia and Asia alone (Larceda, 2003). In the Ghanaian context of ASM mining, gold is extracted mainly from alluvial deposits and for ease of operations through manual washing, miners are attracted to deposits along rivers, waterways and small streams. Gold is processed by crushing and grinding of the gold-bearing ore. The gold is extracted from the pounded or grinded mixture by adding mercury (Hg) and roasting it the open air to get gold. The process allows harmful chemical components ionic Hg (Hg2+) to be released into the atmosphere which later condense on the land and water surfaces. (Larceda & Salomoms, 1998).

2.4.3 Scientific Research on Use of Hg in Artisanal Gold Mining In Ghana

Results of the survey study on assessment of Hg levels in water, sediment, soil and human hair were sampled from the rivers Pra and Offin and their main tributaries revealed high mercury (Hg) contamination. Even water samples collected from areas remote from current gold mining sites, gave high Hg concentrations reaching values of about 148 ng/L. Samples along Offin had Hg levels range of 41.6–420 ng/L. That of lower and Upper Pra showed ranges of 24–294 ng/L and 28.7–403 ng/L, respectively. These levels of Hg, definitely exceed values of safe limits given by international agencies (Bannerman *et al.2003* Adomako and Baah 2002).

Again, the mean values for sediment and soil also exceeded the US-EPA value of 200 ppb in the case of River Offin. Concentrations of Hg in hair samples from the

study area were lower than the WHO (1996) recommended value of 50 p.p.m. These values obtained is a matter of great concern, since most of the rivers in the affected areas empty into the Gulf of Guinea, and any Hg reaching these waters would likely lead to more human exposure via food intake (WHO,1996).

2.4.4 Working Conditions of ASM

ASM is labour-intensive, with low levels of mechanization, and working conditions which are generally far removed from international labour standards. The vast majority are very poor, exploiting marginal deposits in harsh and often dangerous conditions – and working with simple tools and equipment, Processing methods applied by small-scale miners in sand and gravel operations as well as in industrial mineral (feldspar, silica and lime) productions are generally limited to screening (sizing) and sorting, which include both manual and mechanized units of operations. Gold-processing techniques include the more sophisticated gold-recovery methods involving cyanide digestion followed by precipitation with zinc dust or with activated carbon. The general method of gold recovery is by a gravity-concentration process using pans and sluice boxes.

They experience a lack of capital needed to allow even rudimentary production efficiencies and, often, resultant debt bondage and poverty traps, which prevent them from achieving little more than using a day's earnings to feed themselves and their families.

Unregulated, inefficient and, often, illegal pricing and distribution mechanisms and practices contribute further to commercial inefficiencies and, often facilitate, associations by miners, with armed groups involved in human rights violations.

2.4.5 ASM and Land Property Rights

According to Barnes 2009, some policy imperatives have it that, resources allocated to private management must gain legitimacy through having measurable economic advantage over other alternative allocations – efficient use of resources must guide who is given what to manage.

Such policy rigidities are a disservice to the developing world were people lack efficient technology and financial standing to meet certain policy requirements and yet have the capability to make use of simple rudimentary methods if guided and trained to manage a resource and make meaningful livelihood. In Ghana, all natural resources holding minerals are vested government ownership. It is the state therefore who allocates mining concessions though in collaboration with traditional custodians of the resource. However, preference is accorded multinational companies on juicy resources than local small companies like ASM operators. The few licensed ASM operators in Ghana have been allocated areas where gold deposits are minimal and scattered and this is partly responsible for the indebtedness and underdevelopment of the sector.

Article XVII of the Universal Declaration of Human Rights holds that "[e]everyone has a right to own property alone as in association with others" (Article XVII). The realization of property as a human right highlights the importance that is attributed to

the close connection that can exist between material things and the inherent dignity of the human being.

2.5. Lessons Learnt

It has been learnt that the push factors of artisanal small scale mining are lack of economic alternatives, strengthened by unfriendly political and global environment: extreme poverty, land unavailability for the landless, poor educational system that makes a lot of people unemployable (structural unemployment), unemployment, unequal international trade playing ground that continues to make the agricultural sector unattractive, among other factors have further exacerbated the poor livelihoods of many in the world especially those in the developing world.

Therefore, ASM provides over 13 billion jobs worldwide to predominantly rural and migrant people. Even when the state and large mining companies shed off excess workers due to one reason or the other, it is the ASM sector that absorbs the retrenched workers (Hilson, 2005)

Furthermore, small scale mining has raised the living standards of people who otherwise would have lost means of livelihood to drought, economic downturns, conflict and acute unemployment. The sector has helped tremendously in provision of livelihoods and minimized crime. According to Al-Hassan, 1977), but for ASM activities, the developing world would have experienced tremendous crime and rural urban drift than is the situation today.

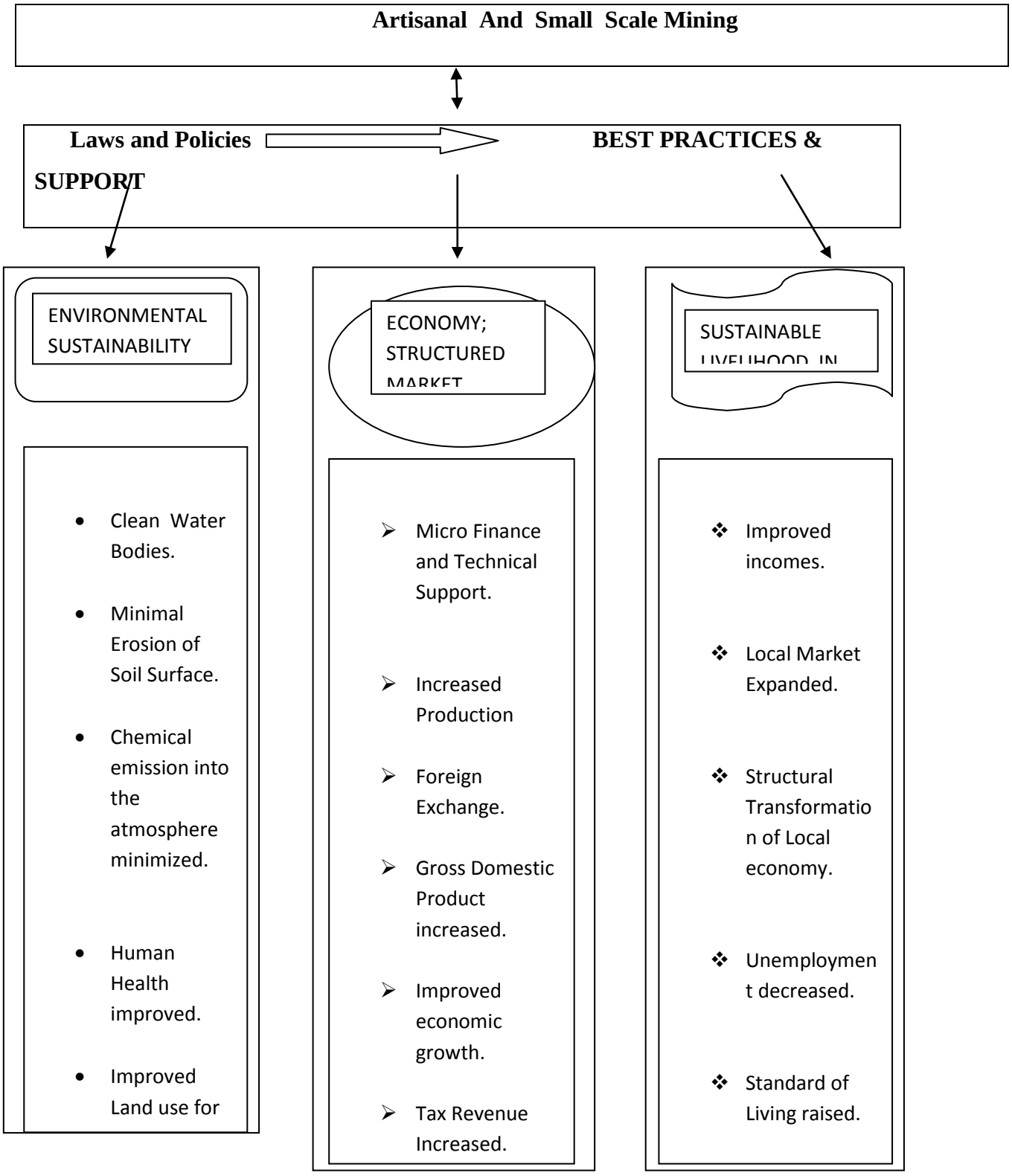
However, it has been learnt that governments have not given the sector the desired attention for it to help them overcome unemployment which is one of the back

aching problems of politicians all over the world. Policies and laws on the sector have been unfriendly and imperious, coupled with lack of interaction, training and financial support as is accorded the agricultural sector. Sustainable and alternative livelihood packages have not fully incorporated shocks of both natural and economic nature therefore exposing the poor to increased poverty.

The neglect and rejection of the ASM sector as a viable means of livelihood and contributor to development may be attributed to its overbearing negative effects. These negative effects notwithstanding, it has been digested from the encounter with copious literature on ASM that, the sector is unique in its own sense from one location to the other, and pragmatic measures need to be taken to ascertain the best way of streamlining the sector and utilizing the potentials the sector has in store – alleviating poverty, minimizing rural urban drift, adding to national income, opening up rural economies and markets for alternative economic activities and improving the general standard of living for the developing world.

Accepting the sector through affirmative resolutions and actions just as is accorded other issues on UN discussion tables can set the foundation upon which managing and realizing the full potentials ASM and minimizing its debilitating impact can be realized.

2.6 Conceptual Framework



Author's Construct (2012)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the techniques, processes and procedures to undertake the study have been elaborated. Therefore, explanations and descriptions of the research design adopted, the data required, sources of data and sampling procedures for data collection have been dealt with in this chapter.

3.1.1 Research Design

The type of research is correlational because the study explores in order to establish interdependence, association or relationship of variables and more importantly ascertain impact of one phenomenon on the other (Kumar, 1996). Since the study seeks to accumulate and analyze reliable data, peculiar to the subject of interest and most importantly verifiable subjectively to a particular phenomenon in a specified area and helps answer why and how a situation exists, the research methodology used is a case study.

Yin .1984 defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used.

Although some authors rebuff the case study method as lacking ground for generality and reliability of findings, It has been chosen as the method of study because of the complex line of the phenomenon of ASM amidst extreme poverty, vie

wanton environmental degradation in order to unravel real-life situations, issues, and problems akin to the Upper East Region through case studying the Talensi Nabdam District. More so, the case study allows the investigator and the case understudy to come into direct contact as assessment of the reactions of a group or community is made through direct observation and questioning.

Again, a case study refers to a unit or an entity and enables empirical enquiry of a unit of analysis into contemporary phenomenon within its real life context using multiple sources of evidence. It is also an explanatory method which establishes intimacy of fieldwork relationships which is usually of great advantage (David and Sutton, 2004).

3.1.2 Data Requirement and Sources

The needed data for this study and units of enquiry; households in the district, the population frame of the district the demographic frame of the district, the number of people engaged in mining, the number of mining sites, the organizations of mining groups, information on environmental issues, number of accidents, the proportion of miners paying tax, disease and inflation incidence. Required

The demographic characteristics of the entire district and that of the mining communities was accessed from the Regional Coordinating Council of the Upper East Region. The regional Statistical Services could not provide detailed demographic data. Socio economic issues on mining were sourced from the Social Welfare Department, Department of Community Development Regional Office and the Commission for Human Rights and Administrative Justice. Also, information on

land degradation, land reclamation, erosion among others was sourced from the Regional Environmental Officer and the Environmental Protection Agency.

Table 5, Focal Data Sources (Unit of Enquiry)

LEVEL	DATA SOURCE	OFFICER	DATA REQUIRED	MODE OF DATA COLLECTION
REGIONAL(UER)	Ghana Statistical Services	Regional statistician	Demographic characteristics	Interview guide.
Regional(UER)	regional coordinating Unit	Regional Economic Planning Officer.	Number of people in mining in the study district Mining, environmental and livelihood issues.	Interview guide.
Regional (UER)	Mineral Commission	Director	Characteristics of mining and mining sites in the region. Viability of the ASM sector to reduce	Interview guide.

			environmental pollution and improve livelihoods	
Regional(UER)	Afrikids	Programme Officer	Number of children in ASM in the district	Interview guide.
Regional(UER)	Department of Community Development/ Regional Coordinating Unit.	The Municipal officer/Regional Coordinating Officer.	Socio-economic issues of Artisanal Small Mining	Interview guide.
The Talensi Nabdam District, UER	Department of Women and children's Affair.	The Regional Director.	The number of women in gold mining.	Interview guide.
Regional(UER)	Mineral commission and the Environmental Protection Agency.	The Regional Environmental Officer and Mineral Commissioner..	Land degradation, land reclamation and environmental pollution.	Interview guide.
Regional (UER)	Regional Health Directorate.	The Regional Director of Health Services.	Health hazards as a result of ASM.	Interview guide.
Communities	Community	Households/	Health	Forum.

	members.	Miners	hazards of and benefits of ASM	
Mining Groups or Companies	Miners	Leaders and workers	So-cio economic issues of mining.	

Author's Construct (Field Survey, 2011)

3.1.3 Data Collection Tools and Instruments

Qualitative and quantitative methods were used for data gathering and analysis**.**

For primary data, it was obtained through participants and non-participants observation to allow informed and detailed information about the activities and effects of ASM, on the people, their communities and social make up and the general economy as a whole.

Secondary data was sourced from the District Assemblies, Hospitals, Mining companies, The Mineral Commission, Ghana Statistical Services and on the internet. Extensive review of related issues in the news, journals and publications was done for relevant information to enrich the study.

The data gathering tools were, structured and semi-structured questionnaire, interview guide, direct observation, pictures through photographic camera, telephone interviews, a pen drive, a computer and a note book. Interview guide was used in conducting the institutional surveys. Through a random sampling, household heads,

women and male miners responded to close and open ended questions which were administered.

Direct observation and qualitative enquiry was done to get at first hand social, environmental and economic information from the people in the six selected communities. Interesting and impacting pictures were taken to support pictorial elaborations of the study. Additionally, telephone calls were made when necessary, to facilitate the swift acquisition of interview time especially with institutions.

3.1.4 Data Sampling

The study used the multi stage sampling technique. The sampling techniques included the purposive sampling method in the determination of institutions and self-help groups and associations interviewed and the random sampling technique was employed in the selection of the various miners (galamseyers) contacted. The purposive sampling is used when the various sampling units satisfy certain criteria of interest while the random sampling technique is employed when there is the need to ensure fair representation of the sampling units.

The study used a mathematical approach in the determination of the sample size of the miners to be involved in the research. The mathematical sampling approach given by Miller and Brewer (2003) is used and is stated as:

$$n = \frac{N}{1 + N(\alpha)^2}$$

Where n = sample size

N = Sample frame

α = margin of error

The sample frame (N) shows the list of the population of the communities to be selected for the study. The sample (n) is then calculated out of the sample frame (N),

under an error margin of 0.08 with a confidence level of 92%. Through substitution into the above formula, where N = 1308, and $\alpha = 0.08$, n becomes 138.

Table 6 Sampled Size Determined for Mine Workers

MINING ENTERPRISE	NUMBER OF WORKERS	SAMPLE SIZE
Unique Group	65	7
Yenyeya Miners	78	8
Pubortaba Mining Group	83	9
Nontaba	75	8
Yinampal 1	64	7
Yinampal 2	60	6
Namdini Enterprise	120	13
Pure Minerals Limited	170	18
Accra Mining Group	102	11
Teltiba Enterprise	86	9
Busaba Investments	140	15
Women Shankers	265	27
Total	1308	138

Source: Author's Construct, 2011

Using the raw sample size figures, mine workers were randomly interviewed. Through accidental sampling upon encountering a group of workers at their base, the 3rd person willing to respond to the researcher was interviewed. With the purposive interviews, institutions, persons and officials who could offer critical and formal information were engaged. Core stakeholders institutions who could best come forth with the needed information on certain objectives of the study were purposely interviewed.

Due to the absence of population and other statistics about the people along the mining belts specifically, the researcher used the community forum for 324 people to

get community responses. Each community of the six, had an open forum which though was controlled by the researcher during responses to enable a fair representation of views across the social and gender divide of the people.

3.1.5 Data Analysis

In understanding the key concepts of the study, the data collected was analyzed. Empirical data collected was processed by editing in order do away with data errors. A detailed descriptive narration and write up has been used for elaborations. Through a systematic recording and notes taking of narrations, experiences, challenges, prospects and benefits of ASM to direct and indirect beneficiary groups, elaborations were done through qualitative analytical means. Interrelated issues and core outstanding findings were made use of to make recommendations and conclusions of the study.

The magnitude of environmental damage and social vises for example that arise out of ASM activities were downplayed by the immediate beneficiaries of the mining communities but through qualitative probing techniques, the issues surfaced prominently for discussion and analysis.

In order to keep the main objectives in focus, the discussions and narration especially those of focus groups were done with quite a level of control. This was done to even further establish the cross sectional validity of some interrelated issues and interests.

Quantitative aspect of the elaboration involved summary of some data mostly shown on tables, graphs and maps. Relevant mathematical and statistical techniques such as the confidence level from the chi square and Guilder's mathematical sampling method of 1993 were used.

CHAPTER FOUR

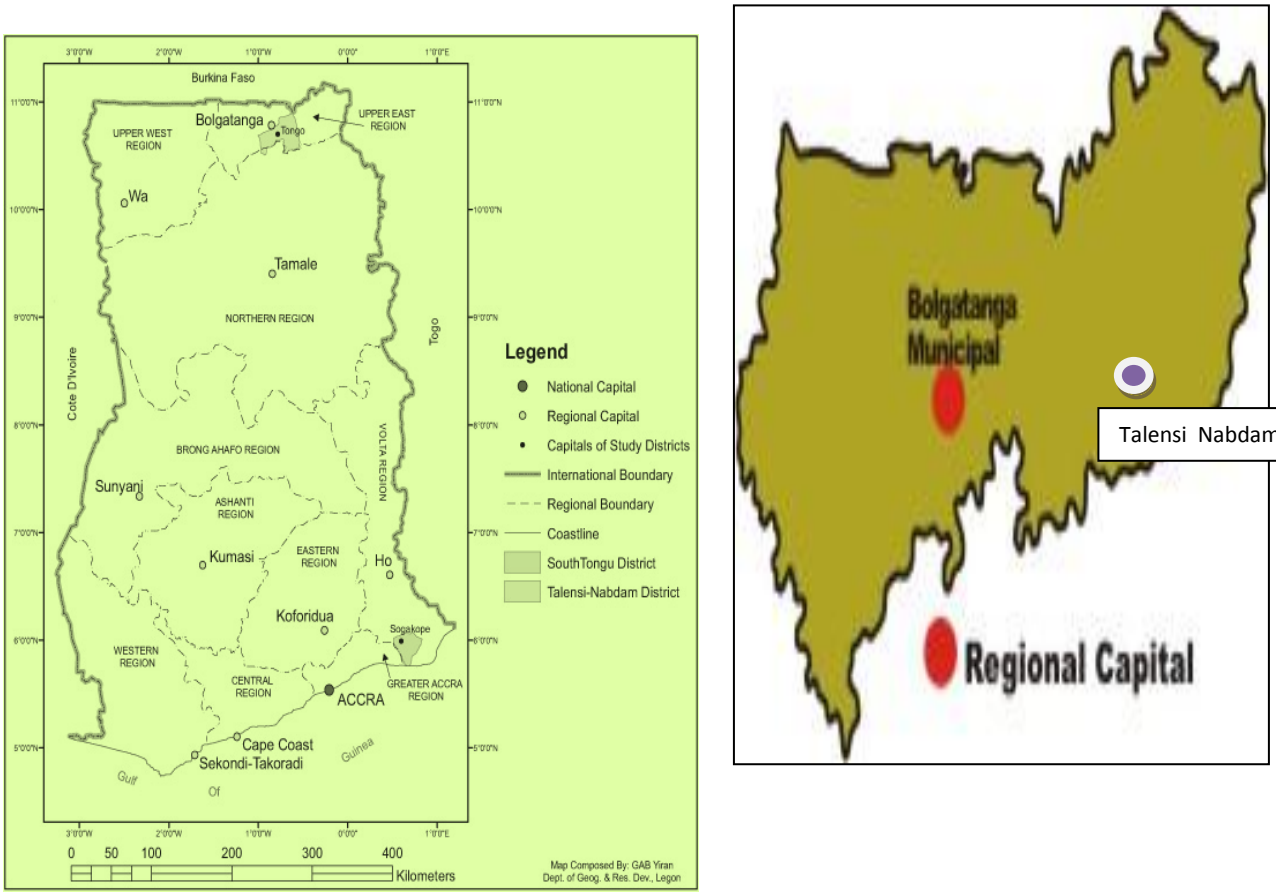
ANALYSES AND DISCUSSIONS

4.1 Introduction

This chapter takes a look at the profile of the Upper East Region before exploring the characteristics of the various stakeholders in the ASM sector. This then is followed with discussion and analyses of the study information gathered.

4.2. Profile of the Upper East Region:

Figure 1. A Map of Ghana and A map of the Upper East Region



Source: ***Ghana**.gov.gh/...**ghana-map**/1239-**regional-map-of-ghana***

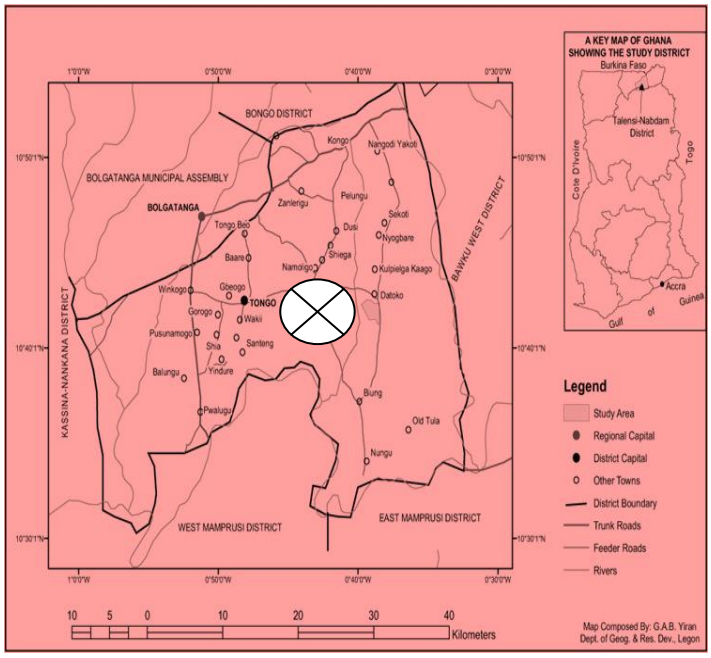
Formerly part of the colonial British administrative Northern Territory from 1902, the Upper Region was carved out in 1960 and was later separated in 1983 into the Upper East and West regions.

The Upper East Region has relatively flat topography interspersed with few hills on a land area of 8,842 sq km. The region's soil fertility is low due to the coarse textured nature of the soil which renders it prone to erosion. It is more exacerbating even, with yearly flooding and water logging. More so, the vegetation is of savanna woodland type and is often scorched by high sun heat most of the year (E.P.A. UER, 2011).

About 67.5 percent of labour in this region is engaged in primary agricultural production. Proportionally, 71.8 percent males and 61 percent females are into agricultural related activities. Only 6.1 percent are employees in the administrative arena. With a population of 917, 251, the Upper East is predominantly a rural community of 84.3 percent and an illiteracy rate of 78.1 percent, far above the national average of 45.8 percent by 2000, and so, has a poverty rate of 84 percent (RCU, 2003).

4.2.1 Location and Site of the Study Area

Figure 2. The Talensi Nabdam District



Source: ***Ghana.gov.gh/...ghana-map/1239-regional-map-of-ghana***

The Talensi Nabdam District was carved out of the then Bolgatanga District Assembly in 2004. It's capital town is Tongo, and is bordered to the North by the Bolgatanga Municipality, South by the West and East Mamprusi Districts of the Northern Region, Kassena Nankani District to the West and the Bawku West District to the East. It has a population of about 94, 650 or 24.8% of the population of the Region which was 917,251 according to the Population and Housing Census for 2000 *(*www.ghana**districts**.com/**districts/**)

4.2.2 Geology and Soils

The district falls within the Birimian, Tarkwaian and Voltarian rocks of Ghana. The surface relief is characterized by flat to gentle slope with uplands of an average elevation of about 300m above sea level which are mostly found in the Tongo and Pwalugu areas of Talensi-Nabdam district. The main rivers are the White and Red Volta and their tributaries. Drainage is mainly by the White, Red Volta, Sissili,Kulubiliga, Owon and Kuldage Rivers, with Kulubiliga and Kuldage as the main tributaries of the White Volta. (RCU. UER, 2003)

4.2.3 Population

The Talensi Nabdam District has a population of 94, 650. The district has 11 towns namely: Zuarungu, Tongo, Duusi, Winkongo, Kongo, Pwalugu, Sheaga, Gbane, Pelungu, Tongo, Wakii, Gorogo, Yikpemeri and Beo. However, the sampled communities for the study are as follows: Yali, Datoku, Yameriga, Gbane, Duusi and Pelungu. Though the Bawku West and the Builsa districts have some gold mining activities, they were very minimal and far from human settlements.

4.3 Stakeholders in the Mining Industry in the Upper East Region

The purpose for clearly identifying stakeholder role in the mining sector will facilitate and contribute to the comprehensive analysis of the study.

1. The Regional Coordinating Council
2. The Talensi District Assembly
3. The Mineral Commission
4. The Environmental Protection Agency
5. Precious Mineral Marketing Company
6. The Mining Communities
7. Ghana Revenue Authority
8. Small Scale Miners

- Regional Coordinating Council (Upper East Region)

The Regional Coordinating Council has administrative oversight responsibility over the 9 decentralised administrative districts - Bolgatanga, Bawku municipalities, Bongo, Kassena-Nankani East, Kassena/Nankana West, Bawku West, Builsa, Garu-Tempane, and Talensi-Nabdam districts in the Upper East Region. It has as part of its objectives, the alleviation of extreme poverty.

- The Talensi Nabdam District Assembly

This is one of the 9 districts assemblies of the Upper East Region and is the host district of brisk mining activities in the Upper East Region.

- The Mineral Commission

The Ministry of Lands and Natural Resources is the Sector ministry under which the Mineral Commission falls. The Minerals Commission is the agency that advises the Ministry of Lands and Natural Resources on all matters relating to all minerals and is responsible for implementation of the sector policies.

The Inspectorate Division is responsible for ensuring safety and health practices in the mining industry. However, the commission is under resourced in the region with very few staff and one vehicle.

- The Environmental Protection Agency (Bolgatanga)

As an implementing and regulatory agency under the Ministry of Environment, Science & Technology the EPA of Ghana is to co-manage, protect and enhance the country's environment through an integrated environmental planning and management system established on a broad base of public participation, efficient implementation of appropriate programmes and technical services, giving good counsel on environmental management as well as effective and consistent enforcement of environmental laws and regulations.

- Precious Mineral Marketing Company

The mission of the Company is to buy from small-scale miners and sell precious minerals such as diamond and gold profitably, so as to enhance Ghana's foreign exchange earnings from this sector as well as to promote the development of such minerals and the jewellery industry in the country. The offices of the PMMC in the region is not regular and miners do not even know of their existence, except their knowledge of agents who buy gold for PMMC

- The Mining Communities

The Mining Communities the Study Communities are Datoku, Yameriga, Gbane, Duusi, Pelungu and Yali. During the community forum, turnout was quite encouraging raging between 70% -85%. The members of the communities passionately disclosed the benefits of small scale mining as source of income, community market enhancer, employment for single mothers and widows, improved living, no more extreme hunger in their communities, and many more but were reluctant to point out the negative environmental degradation being caused by small scale mining activities.

- The Ghana Revenue Authority (Domestic Tax Unit, Bolgatanga)

The Domestic Tax Unit of the Ghana Revenue Authority in the region is charged with the responsibility of collecting and accumulating tax revenue for the nation. The regional accountant of the DTU in the Upper East Region was optimistic of the mining sector's potential of being a huge source of revenue to the region and wished the streamlining and regularization of the sector to remove the current obstacles they face in trying to even identify the miners let alone to collect taxes.

- Small Scale Miners

The miners expressed dismay at the lack of support they receive from government and bemoaned that even the previous help in the form of mining machinery offered them turned out to be a huge disservice to them because the machines were of high capacity energy consumption type and since there was no electricity, they ended up spending exorbitantly to purchase diesel to power the machines and this made them

run at huge losses. It came to light that many of them joined mining due to crop failure and drought.

Again, many conceded that mining was more lucrative than farming. Majority of them threatened to lay down their lives to protect their activities and rejected any alternative livelihood training. It was realized that many of the miners around that district were registered small scale miners with legal concessions. In all there were eleven registered mining enterprises:

1. Unique Group
2. Yenyeya Miners
3. Pubortaba Mining Group
4. Nontaba
5. Yinampal 1
6. Yinampal 2
7. Namdini Company Ltd
8. Pure Minerals Limited
9. Accra Mining Group
10. Teltiba Enterprise
11. BuSaba International Investments

4.4 Mining in the Upper East Region

Mining in the Upper East Region was found to be characterized by unique features like mining in between residential houses, family ownerships of mining concessions, lack of water and strict compliance with community directive not to fell sheanut trees in order to mine. Again, there are no large mining companies in the area under study. This, it was revealed was by the fact that identified deposits were not

attractive enough for huge investments. Hence, the usual tense, suspicious and apprehensive environment surrounding other mining areas was missing. The official mining concession for small scale mining in the

Talensi Nabdam mining belt is 72sq km (Minerals Commission, 2011, Bolgatanga). However, there are pockets of mining going on families farm lands, let out lands by chiefs and other land owners. It is on such lands that illegal miners are found.

The mining done in this area under study was found to be low in technology and machinery usage. Unlike the small scale miner around Tarkwa or Ayanfuri the small scale registered miners here are just like " galamsey" operators with very minimal application of standards of mining to avert environmental damage. Their financial and technological capacity was found to be low and this could be so glaring as one moved from one concession area to another and saw no machines except water pumping machines, no electricity, an abandoned and almost rusted power generator, among manual and fuel powered grinding machines.

4.4.1 Low Technology and Losses

Due to the crude method of mining, huge amount of gold is lost in the extraction process. Gold bearing rocks which are manually cracked into chips are grounded in the smooth powder as much as possible using grinding machines. These are then sieved and manually washed in water to extract the gold. The Mineral Commission estimates that about a fourth of gold is lost to improper and low technological methods of extraction.

Plate 1. Crude gold extraction process.

Source: Field Survey, 2011

4.5. Driving factors of Mining in the Upper East Region.

4.5.1 Poverty

The survey revealed that, the increase in mining activities in the Upper East Region was highly linked to poverty – poverty level of 84 percent. Many men and women earn their livelihood from the mining sector and are very much conscious of the negative effects of mining in the crude way as they do. The Economic Planning Officer of the Talensi Nabdam District estimates that about 10, 600 people are employed in the mining sector. The Mineral Commission in the region revealed that though the deposits of gold are not very huge, the spread of it in smaller quantities is vast and there is the potential of gold mining in small quantities for a very long time to come (Mineral Commission, Bolgatanga). And perhaps conscious of this finding, the miners interviewed swore upon their lives to prevent any large Gold Mining Company from establishing on their land and eventually deny them of their daily survival on mining.

4.5.2 Unemployment

Mining has become a remedy to high off farm unemployment in the region. The limited rainfall period does not favour crop farming. With just a four month period of farming opportunity, the people are mostly idle during the dry season. According

to the Statistical Services of the Upper East Region, the population of the region stands at 1, 031. 478 per the 2010 population census provisional results and over two thirds of the population are farmers. Therefore, majority of them resort to mining after farming period. In a discussion with the District Economic Planning Officer, it was revealed that the region has high youth unemployment far above the national unemployment figure of 78 percent and essentially, the high illiteracy rate of 78.1 percent has made majority of the population unskilled.

4.5.3 Poor Land Fertility and Post Harvest Loses

Before the introduction of small-scale mining into the district in the early 1990s, the main livelihood activities of the people, were farming, livestock-rearing and hunting, shea-nut picking and fuel wood gathering for women. Farming was the major livelihood activity and was centered on food crop (sorghum, cereal and legume) production.

The land of the area under survey is rocky, with a lot of stones mixed with clayey and loamy soils. The land texture around Datoku is highly rocky, interspersed with loamy whilst the land at Sheiga is mostly stones and clay. When he was interviewed the a native of Sheiga revealed that tilling the land in the area is so tedious because the stones have to be gathered to enable planting, sowing and germination of crop seeds. He stressed that, any farmer who sows his crops without gathering the stones would have most seeds not germinating and the few that germinate will have their roots choked by the stones. Besides the Regional Economic Planning officer declared that, the Upper East Region is densely populated with exception of the Fumbisi Valleys. So the land area for farming is limited. He further said that, even

the limited land which mostly lies in between residential areas has lost its fertility. He further revealed that the culture of the region is that people build and reside on their lands and any other land is vested in the chief of Land Priests. Therefore in the event of the land losing its fertility, there is no access to land easily. This he lamented has forced many, especially the youth to go into mining.

Plate 2. A picture of stony land at Shiega where stones have been gathered to allow sowing.

Source: Survey, 2011

According to the Regional Coordinating Director, even though the region does not have enough irrigation dams, the people around the two major irrigation dams-Tono and Vea produce a lot of vegetables. Other areas too use smaller dams or pump water from streams and rivers to produce vegetables such as onions, carrots, cabbages, tomatoes, garden eggs, pepper among other vegetables during the long dry season. He however lamented about lack of market for the produce which results in huge post harvest loses, thereby, discouraging many from farming and pushing them into mining.

He further added the rigors of the weather such as low rainfall, late heavy rains, flooding and bush fires as crucial factors militating against farming in the region.

4.5.4 Income from Mining

A blade of gold, as it is commonly measured among the miners, sells at between ¢42.00 and ¢50.00. Most of the miners sell their products of gold to the middle men who in turn sell to the Precious Mineral Marketing Company in Bolgatanga. An ordinary mine worker makes between ¢600 and ¢1800 in a month, while pit owners or small scale miners make between ¢20.000 and ¢150,000.

Huge profit making is skewed towards people who had the money to sponsor pit or land owners. These middle men are mainly licensed buyers who have arrangements with pit owners and miners by way of pre financing activities or purchasing mine equipment. There are no regulated methods of sharing profits and it is the sponsors who determine how much pit owners and miners who are mostly indigenes of the area earn.

4.6. Economy and Livelihoods

There was evidence of a booming economic life along the area of study as one went round: shops, kiosks, food vendors, seamstresses and tailors, boutiques, among other activities. In an interview, the Economic Planning Officer espoused the enormous impact of mining on livelihoods in the area under study. He mentioned the huge market opportunity for immediate communities, Tongo and the Bolgatanga marketing and shopping space. Throwing more light, he mentioned the increase in revenue of the District's Internally Generated Funds due to licensing and daily rates taken from the mining activities and traders along Duusi, Shiega, Datoku, Biung, Pelungu , Zomela Tongo among other villages along the North Eastern parts of the district where mining is wide spread.

Further, he narrated the past suffering of the people as a result of lack of meaningful means of livelihood. According to him, many of the people were hungry and highly impoverished before the mining activities started but now the peoples' livelihoods have improved tremendously.

However, he lamented that the emerging high cost of living in the region was as a result of mining incomes and the indiscriminate spending habits of miners. This phenomenon may cause class and economic hype against the rest of the districts in the region, who do not have mining opportunities.

When interviewed, the Regional Coordinating Director revealed that, the Upper East Region predominantly an agricultural economy of 65.9 percent, with proportions of 71.8 percent males and 61.2 percent females in agriculture, the region's populace does not have all year crop subsistence. The climate is characterized by one rainy season from May/June to September/October with a long spell of dry season from November to mid March. The mean annual rainfall during this period is between 800 mm and 1.100 mm. The rainfall is erratic in duration and that the Upper East Region has been experiencing annual flooding for the past decade which resulted in the loss of about 12,221 ha of farm land and 15,069 houses were damaged in 2007, Ghanaian Times 28th September, 2007 edition.

Community Forum

Case 1

In the early 1990s when we started this work, our dignity has been restored, recounts Pusolgo Awini. I and some of my friends here were doing dirty and tedious work in the south. We could hardly feed let alone remit our families and do any property. Now every one of us, at least has no starving family members, as was the case before gold discovery on our land. Madam, I do not know how to describe what we were facing. But all I can say is that, we thank our ancestors for the gold and if anyone dares bring any big mining companies to come and take over, we prefer death than to watch that happen.

As at now, no one in this community is against the mining we are engaged in. Before mining started, the communities around here and beyond were very poor with no markets but now see even the shops around us. We buy the things they sell. A lot of women sell food to us and they make their livelihoods from it.

I can make GHc20, 000.00 in a good day and the least will be GHc3,000.00. Of course at times we make losses and that is because we use outmoded technology, buy a lot of diesel due to the absence of electricity and poor extraction methods.

I and my colleagues received support some time ago but the terms were very harsh for us. Instead of them to give us the money or engaging us to decide what our priorities are, a machine was bought for us to use and pay. However, because the machines are high power consuming type and there is no electricity but diesel to power them, they all became faulty within no time. We asked the cost of repair and it is so costly that we cannot afford.

Case 2

My name is Charles Yeni. I have large farm lands just after the next village. I hope when you were coming, you saw the type of land we have right from Shiega. Tell me, how much harvest can one get from such a rocky area with stones dominating the soil? Even after the stones have been gathered, the crops still do not do well. I travelled beyond Balungu to farm and if it is not floods, it drought that destroy all the millet I labored to plant. This is why I decided to join my brothers and friends in this business. To be frank when this mining started, I did not like it at all because of the risk of being in some pit, people losing their lives, others developing sicknesses and so on but at a point I had no choice.

Yes, the mining we do is helping us but the environment is also suffering. We try to do our best to cover the pits but at times shovel and pickaxe cannot do much and hiring a tractor to do it is expensive so we wait for some time, bring it in at shared cost among the groups and it will fill the various pits.

4.6.1 Women and Mining

The small scale mining activities in the area of study was found to be hugely supported by women. It was realized that, after the gold bearing rocks have been dug up, the rest of the activities involved to get the gold extracted was done by women. They pound and do the sieving (shanking) after the grinding machines have ground the pounded stones. During the grinding, so much dust is emitted and the women, who are attendants at the grinding, are exposed to dust inhalation. Besides, a cloud of dust is released during " shanking" which is done very closely together . Below is "shanking" process image captured during the survey:

Plate 3. A group of women sieving grinded gold dust.

Source: Field Survey, 2011

Case 3

I am a widow and my name is Priscilla Womama. This is the work I have done since my husband passed away to take care of my children. All my children are in school; especially the one in the University would not have gone if it had not been for this work. In fact, with no one in my husband's family to take of my children and me, the only solution would have been to commit suicide.

I agree that the sieving is injurious to our health. Some people came here and sensitized us about the dust inhalation but the issue is that, we do not know where to get the "nose covering thing" to buy. We try using pieces of cloth to cover our nose but I still cough out and blow dust filled phlegm.

Other members of the community confirmed the fact that they were aware of the dangers of 'shanking' without protective cloths but were helpless, due to the unavailability of the nose masks for purchase.

When the manger of Unique Mining Group was contacted, he declared: I know the effects but madam, how do we get the nose masks? An organization came here, educated us and gave out a few of the masks and promised to come back with more and they did not fulfill their promise.

Case 4

I am Akos Abonyiga. Besides taking care of my children, I am the sole bread winner of my family. My brother died and left four children. His wife is disabled and cannot do any work to support. My mother is old and our farm lands have been taken over by the clan head who only allows us to farm just a little portion of land. That aside, farming is not beneficial again. Our work is helping so much.

There are a few children engaged in mining now. Some people came around and sensitized us for close to three years to stop using children. They were almost coming here every week till the use of children minimized. They even took some children to go to school or learn some vocations.

Case 5

My name is Teny Yindubil. I can now feed and cloth my family because of 'shanking' for miners. Last year, even though I did not farm, I was able to buy two bags of millet, a bag of maize, and other food stuffs for storage against the lean season. I and my children are no longer hungry.

I was even able raise over thirteen million old Ghana cedis to send my son to the University.

Case 6

I am Posulbo, the chief representative of this Sheiga community. The miners are our kith and kin so we do not charge them or sell the land to them. The chief is only entitled to a portion of gold bearing rocks on a land released for mining. Family members who also release their lands have the same arrangements with miners.

The miners have a strong agreement with the traditional rulers not to cut any sheanut tree before mining. They have so far not disobeyed so there is no problem between the chiefs and the miners.

We are happy for our children. These days some of them own cars, others have built their homes and even some own houses in the capital city of Bolgatanga. The strangers among them like the Akans also go home and have their properties done. So it is not even our kindred alone but the whole Ghana is benefiting.

Ogyam, an Ashanti man from Mampong Nsuta confirmed the presence of many Akans and other tribes from southern Ghana who are small scale miners in the Talensi Nabdam District.

Ayibilsa Akango is my name. I have been mining for 17years here in Sheiga (Obuasi). I am not a native of this community but we have been mining all this time and there are no serious disagreements between miners and the community owners and natives.

Our only appeal to the chief which he and the Member of Parliament have not tried to help us is the lack of electricity and clinic. During the last electioneering campaign, we were promised electrical power but up till now no one has even come to say anything about it.

4.7 ASM and the Environment

The low technological mining practices in the Talensi Nabdam mining belt is glaring upon familiarizing and observing the activities of miners in the area. After using dynamites to blast rocks in pits some as shallow as 30 ft, the miners use water pumps powered by diesel to evacuate any underground water. Ordinary pickaxes and shovels are then used to send up the blasted stones which bare gold for processing. Once the rocks are out of the pits, they are milled into smaller chips. The chips are further ground in diesel powered grinding machines. During the grinding, so much dust is released into the community atmosphere. Attendants at the mills are women who work for the miners at all the five grinding mills at "Obuasi".

All around the grinding sites, thick clouds of dust could be seen surging into the atmosphere. According to the attendants, they have been milling large quantities of gold bearing chips everyday without any protection both for themselves, the women and the community as a whole. The roof top of every building was coated thick with dust. When interviewed, the Environmental Protection Agency bemoaned the situation and was quite weary about the uncooperative behavior of the miners towards collaborative meetings they have had with them, directives and sensitization on improvised ways of minimizing dust emission.

During an interview with Nongtaba Group, it was revealed that, the Environmental Protection Agency once even threatened to stop the open grinding. They however blamed the women and mill operators for not doing the simple things like wearing a tube on the mouth of the grinding machine to minimize the dust emission.

4.7.1 Water Pollution

A survey around the area of study showed pits left uncovered and heaped soils which have solidified into small hills all around the mining communities. Rivers, streams and ponds have been turned into washing bays for gold dust. Although almost all the ponds and streams had turned brownish and highly polluted to pass for human consumption, the only river passing through the area which is a tributary of the White Volta was not spared either. People could be seen washing gold dust into the White Volta too.

In an interview with the leader of Unique Mining Group, he cited minimal number of water bodies in the area as the major reason why the miners do not want to cover up dug pits after mining the pits so that the pits can serve as ponds in which rain can collect for their use. He further revealed that, it is a luxury to let water used flow away and that they have been waiting for over weeks now for rain water to enable them process gold ore.

Plate 4. Mosquito infested ponds

Source: Field survey, 2011

Plate 5, A woman and a Child Washing Gold Dust in a stream at Gbane

Source: Field Survey: 2011

In an interview with the Minerals Commission, it was revealed that the cost of reclaiming the land as individual groups is much expensive. It was however established that some of the miners do reclaim the land after mining. The Environmental Protection Agency on the other hand mentioned an ongoing environmental sensitization programme to remedy water pollution. It was also revealed that sanctions will be applied to recalcitrant miners who do not cover their pits in due time.

Community members were quite worried about the open pits and described how two children have drowned in the pits and how the pits have become mosquito breeding grounds. The pits are right in the midst of residential areas and pose great danger to lives.

4.7.2 Erosion

The dug land which has been left unattended to has become vulnerable to erosion. Even though the survey period was in the dry season of the Upper East Region, the gaping gullies created by erosion were quite glaring. Right from the Duusi to Shiega, the rocky land could be seen to be conquered by erosion.

Erosion along the Banks of the White Volta was also quite degrading. At both sides of the river, wide gullies were seen. Again, since there is no bridge over the river, both human and vehicles pass through the river to cross over to 'Accra'. When he was interviewed, the chief's representative expressed his frustration over the lack of roads in the area and blamed politicians over the situation. He narrated how a school girl drowned in the river during a rainy season when the river was full. He further bemoaned the fact that the sloppy road allows rain water to wash all the human excreta in the open fields due to lack of places of convenience into the river. This meant that all the chemical waste left by miners along the various stretch of mining areas are easily washed down into the river.

Plate 6. Road passing through the River White Volta

Source: Field Survey, 2011

Further revelation from the EPA was that the course textured nature of some parts of the land in the mining belt renders the land susceptible to erosion. It was stated that the chemicals used in the mining activities are powerful and weaken the compactness of the soil and it makes it vulnerable to erosion. The EPA mentioned chemicals such as silicon and mercury which are the major chemicals used in gold processing and the chemicals were cited to be more inimical to the health of the

people. Again, the EPA mentioned the fact that the region is highly prone to erosion because the soil type is mainly developed from granite rocks and is prone to erosion due to the shallow and coarse textured nature of the soil.

4.7.3 Community Perspective on Environmental Pollution

Most community members showed their displeasure about the dust and wished a way could be found to reduce the amount of dust. On the other hand, they vehemently opposed any suggestion of strict regulation that might stall the mining activities. The outstanding issue about community participation and contribution to environmental pollution was the communal apathy. Right behind and in front of peoples' houses were, gaping ponds full of mud, filth and mosquito infests.

Almost every one interviewed was aware of pollution of water sources from mercury, cyanide, dust, mine pits, among others, but looked on. According to the Mineral Commission countless number of organizations including the EPA have educated the communities on a number of times about the issues of the environment and their health. The MC therefore suggests regulation and supervision especially from the District Assembly.

Plate 7. A Picture Showing Nzor, a Mill Attendant Covered In Dust

Source: Field Survey, 2011

Plate 8. A Grinding Mill Exclusively Meant for Gold Chips

Source: Field Survey: 2011

4.8 Local Economy and ASM

4.8.1 Socio - Economic Impact of Artisanal and Small Scale Mining in the Region

A visit to Nangodi, Duusi, Pelungu, Skoti, Datuku and Sheaga, in the Talensi Nabdam District, Sherigu in the Bolgatanga Municipality and Fumbisi in the Builsa district reveals the extent to which quite a number of people of the Upper East

Region, especially the youth and women are relying on Artisanal Small Scale Mining as their source of income.

With all the mining sites mentioned, it is only Duusi and Gbani which has a legal mining concession size of 74 sq km acquired in 1995. The rest of mining sites stretching from Nangodi to Pelungu to Datuko are operated illegally, through crude mining methods and is combination of surface and underground hard rock mining. Dug out trenches and deep pits are left uncovered and are breeding mosquitoes. The hospital admissions of the regional rate stood at 25.54 percent against 6.4 for Greater Accra Region (Ghana Health Services, 2010 interagency review). ASM camps in the region have rapidly become locations of widespread prostitution, drug abuse, child labour with significant high rate of disease such as HIV/AIDS infection rate of 2.2 far above the national rate of 0.2.

In a discussion with the people at the fora, it came out that the mining activities are the major boost to the economy of the region. Shops interviewed in Tongo, the district capital and Bolgatanga, the Regional capital, pointed to the fact that miners and people from the mining areas are the major customers.

The market women in Tongo explained that during the heavy rains and flooding, which affects some mining activities, and miners are unable to make enough income to patronize their goods they see huge differences in sales. This was confirmed by shops in Bolgatanga when the Adonai shop and Bisimilai Motor Dealers also said their major customers are miners.

The Regional Coordinating Director, reiterated that, most of the buildings being constructed in the villages and in the towns are for miners and that though they are

the major boost to the economy of the region, they are also the reason for the high cost of living in the region.

The Talensi Nabdam District Planning Officer added that, though he cannot estimate empirically, there is increase in enrolment of children in private schools in the mining belt district where it would have been difficult to find even one private school. He also mentioned the wide spread use of cement blocks and aluminum roofing sheets in building than the previous use of mud for building which rendered houses susceptible to collapsing during heavy rains and flooding. In fact, he reechoed the general improvement in the living standard of the people in the region as a whole and attributed it to the mining opportunities.

However, during interviews and discussions, especially at the community for a, the negative impact of mining included not only the environmental pollution, but increased drug abuse, addiction and prostitution. Atule, an elderly woman, narrated how their daughters are no more interested in marriage and responsible lives but are moving from one relationship to the order. She lamented about the upsurge in migrant prostitutes to the area and called for a remedy. The chief's representative confirmed this and blamed the situation of increased drug addiction and prostitution on the failure of the police to do their work since the laws of the land frown on such social vices. He added that, since child labour in mining has been reduced through various interventions by some organizations including the police, he does not understand why the other vices cannot be curbed.

4.8.2 Prospects of Government Support

Under the Millennium Development Goals, eradicating extreme poverty is the number one goal which targets to halve the proportion of people whose income is less than $1 a day between 1990 and 2015. It is in this vein that the Regional Economic Planning Officer espoused the dire need for government to give special attention to the mining sector in the region. According to the REPO, artisanal and small scale mining might be undesirable considering the negative impact it has on the environment and human health but under the current limited economic opportunities for the region, the people, especially the youth have no choice but to take advantage of the prospects in mining. As an input into any government policy to enhance mining in the region, the REPO suggested regularization, regulation and support, separately pertaining to the unique requirements of the region and not a fusing into the national mining laws. He particularly hinged it on the need for compliance through the peoples input and participation in formulating such regulations.

In a discussion with the Mineral Commission in the region, it was clear that previous government interventions were not done in collaboration with the mining communities and the miners. So for example, it was revealed that the mining groups have defaulted in the loan payments towards machines purchased for them because the machines were of high energy consumption capacity and without electricity in the area, all the machines offered to the miners by the Ministry of Mines and Energy in 2007 on loan basis have run down.

The District Economic Planning Officer of the Talensi Nabdam District recommended direct government intervention through technical and financial

support as well as stringent regulation and monitoring to enable mining in the region to become a viable means of employment and an important source of alleviating extreme poverty.

4.8.3 Local Stakeholder Aspiration

It was evident in all interviews, discussions and fora that mining has been perceived to be a remedy to the regions deprivation and poverty. The chief of Gbani elaborated when he likened the mining in the region to divine intervention to feed, clothe and put smiles on the faces of the people. The District Economic Planning Officer was very optimistic that, mining has the potential of improving the general economy of the region and serve as one of the major avenues of lifting the region out of extreme poverty.

CHAPTER FIVE

PRESENTATION OF FINDINGS AND RECOMMENDATION

5.1 Introduction

This chapter delves into the key issues raised in chapter four of which identified stakeholder profile and responsibility, as they pertain to Artisanal and Small Scale Mining and its effect on the environment and livelihoods discussed. The issues emanating from the analysis on the interviews, discussions and fora with stakeholder communities, will form the core of findings. However, a summary of issues that highlight findings on sustainable small scale mining to enhance livelihoods is dealt with at the concluding part of this section.

5.1.1 Findings

Objective One

To examine the causes of ASM in the Talensi Nabdam District in the Upper East Region.

RESEARCH QUESTION ONE: What are the driving factors of increased Artisanal Small Scale Mining in the Upper East Region?

- From the analysis, the explaining factors of increasing interest of the people of the Upper East Region in ASM stem from a host of reasons, which include massive national youth unemployment of above 71.6% as at September, 2007 (World Bank). The Statistical Services in the region could not provide data of youth unemployment.

- Extreme poverty level of the region stands at 84 percent. The Upper East Region has high poverty and deprivation. Poverty ratings of 2008, using consumption/income poverty based on the Purchasing Parity Power (PPP) of $1 and PPP of $2 per day poverty lines gives the Upper East Region, over 84 percent, although the Ghanaian national average sands at 28 percent, (World Bank, 2007).
- Infertile soils, which give of poor yields, frequent flooding and water logging of farm lands and scanty rains. The Upper East Region experiences annual flooding for the past decade and the 28th September, 2007 edition of the Ghanaian Times News Paper reported that about 12,221 ha of farm land and 15,069 houses were damaged by floods in the Upper East Region.
- Long off farm activities period and post harvest loses as a result limited market and storage facilities. (Regional Coordinating Director U.E R, 2011) .
- To the People, mining is more financially rewarding than Agriculture (Field Survey, 2011).
- Artisanship and entrepreneurship is low due to widespread poverty which limits patronage of services, (Widows and Orphans Foundation, U.E.R. 2011)
- Illiteracy of 78.1 percent has rendered much of the population unskilled and structurally unemployed, (R.C.C., U.E.R. 2010).

Objective Two

Analyze the effects of ASM on the socio – economic situation of the people.

RESEARCH QUESTION TWO: Are there socio-economic implications of widespread ASM in the Region.

- Artisanal and Small Scale Mining has made the Upper East Region, especially Bolgatanga, the regional capital, to have a high price index of goods and services (R.C.C., U.E.R.)

There has been tremendous improvement in the quality of housing in some communities which hither to had mud houses that collapsed at the least weather provocation.

- Extreme deprivation of food and clothing has become low along the mining belt.
- Over 10,000 people earn their livelihood through ASM.
- Commercial activities are booming in some parts of the region.
- There is upsurge in drug addiction and prostitution.
- In the Gbani mining belt for example mining has taken precedence over agricultural activities and there is threat to food crop production (, 2011).
- There is a decrease in youth migration to the south of the country in the Upper East Region, especially of youth along the mining belt (R.C.C., U.E.R., 2011).

Objective Three

Assess the environmental implication of ASM to the Region.

RESEARCH QUESTION THREE: What are the effects of ASM on the Region's environment?

- Both water and air are polluted by dust and chemicals.
- Stagnant water in dug out pits is breeding mosquitoes.

- No stringent measures are applied to environmental issues in the region as pits are left un- reclaimed.
- The soil type (course textured developed from granite) renders the land to immense erosion, after mining dugouts.
- Chemical deposits further worsen the loose compactness of the soil and make it infertile for crop production and animal grazing.

Objective four

Assess the opportunities that will accrue to people of the region if government applies stringent regulation and technology and investment support to ASM.

RESEARCH QUESTION FOUR: Can ASM become a viable means of livelihood to the people to reduce extreme poverty in the Upper East Region?

Regulatory measures developed with the people of the mining communities and miners alike will drastically reduce environmental degradation and promote concurrent agricultural activities to alleviate hunger and poverty. This is evident with the success of community, miners and EPA agreement of not felling sheanut trees whatsoever for mining purposes.

- Infrastructural development of the area, especially extension of the national electricity grid to the mining belts of the region will facilitate proper processing of the gold ore to avoid the huge loss of gold through crude methods of refining. This will increase incomes and livelihoods will improve.

- Financial assistance to the small scale miners will enable them acquire modern mining equipment for safe mining and increase gold yield in the region.
- Stakeholder institutions like the EPA, the Mineral Commission and the District Assemblies can make the mining activities less injurious to the people and the natural environment through collaboration and networking to ensure good pract65ices.
- Support programmes in the form of technical training can enhance quality of labor for mining activities, minimize injuries, increase production and attract many more unemployed youth.

However, Stakeholder opinions indicate that some of the possible setbacks in support project that may lead to project failure are: beneficiary - implementer relationship gap, the psychological perceptions of beneficiaries, project concept generation and project appropriateness and targeting.

5.1.2 Recommendation

- **Modernizing the Agricultural Sector**

The study gathered that, the Upper East Region is disadvantaged when it comes to natural endowments such as enough arable land and good rain pattern for agricultural purposes. It is therefore important for government to promote mechanized agriculture in the region. The existing irrigation projects at Tono and Vea can be replicated in the Talensi, using the kulbila river, Bawku using the White Volta and Builsa using the Fumbisi valleys, to make farming attractive. And in order to do away with post harvest losses buffer stocking can be strengthened and more

importantly, rice production rather than tomatoes farming should be encouraged because it appears our neighbours – the Burkinabe's have a comparative advantage over Ghana when it comes to tomatoes production. .

To deal with the annual flooding of blossoming farms, water released from Burkina Faso's Bagri Dam and excess rain water can be stored in artificial water reservoirs to support irrigation for dry season farming in areas where sophisticated irrigation projects cannot be developed. These measures may take away a large number of people from the mining sector into farming to curtail the looming threat of mining taking over food crop production.

- **Dealing with Environmental Degradation**

Note must be taken of the fact that, central to the achievements of the health Millennium Development Goals is the environment. So, just as the phrase "environment is the golden thread, the red ribbon, running through and round all the MDGs goals," which emerged at the United Nations Environmental Programme's 14th council meeting, and emphasizes the link between the environment and livelihoods, dealing with environmental issues is core. Clamp downs on ASM have largely failed in this country and it is the enforcement of the laws that will help promote good practices.

This, government can do, through collaboration with local stakeholders like chiefs, land owners, the district assemblies and the miners as was done in China for the people of Shoushou Province to develop regulations peculiar to the region rather than the current national mining laws, which the people find rather cumbersome and distant to their actual needs on the ground. The regulations can be developed in the local languages of the people to make them easily understandable to the people.

Such policy although unique to the region must as much as possible be subservient to the national mining and environmental laws especially the much clarified Mining and Mineral Laws of 2006.

- **Stakeholder Institutions Collaboration**

There should be coordination among state structures which are connected to mining, livelihood enhancement, poverty reduction, health, infrastructural development, law enforcement and environmental protection to ensure effective evaluation, monitoring and input management. Aside coordination among key institutions, the Mineral Commission and the Environmental Protection Agency in the region must be resourced with both human and material resources to enable them discharge their mandate effectively.

- **Developing the Mining Sector**

The region is also an extreme poverty zone where entrepreneurial fortunes are limited. It is of this backdrop that it is recommended that in spite of the environmental problems, a special attention should be accorded the mining sector in the region by government to minimize the environmental degradation and unearth the potentials of ASM to eradicate extreme poverty which is one of the 15 Millennium Development Goals Ghana is pursuing to achieve. The support can be in the form of financial and technical support for miners to enhance their mining and extraction skills. This when done especially in the area of refining or extraction, large amounts of gold lost yearly can be harnessed.

Central to the development of the mining sector in the area is infrastructural development. The main road from Tongo to the Gbane mining belt which is a feeder road needs to be upgraded to facilitate movement. More essentially there is the urgent need to build a bridge over the tributary of the White Volta to stop the people from using the river bed as a road to and from "Obuasi" and "Accra".

Electrical power plays a very important role in the mining industry be it small or large. The increased crude methods of mining are the reason for the exacerbation of the environmental degradation. Therefore, extension of power to the area will enable the miners use basic mining machinery in their operations.

- **Wealth Creation**

The mining belts of the Upper East Region, should not be open to large mining companies but rather, indigenous small scale miners should be empowered to mine. It is by so doing that the investments and financial benefits of the mining activities will properly inure to the improvement of lives and help alleviate the high rate of poverty in the region.

Poverty reduction projects might only be sustainable and beneficial to the people if their natural endowments, entitlements and skills are considered as major components in fashioning out programmes to enhance livelihoods.

5.1.3 Conclusion

There is incidence of pollution of varied kinds - air, noise and water to the environment. Water pollution has affected mainly water resources within the area. The White Volta and its tributaries which are the main drainage in the region is

increasingly silted and was evident during the study that mining activities contribute tremendously to river's siltation.

The soil type which is course textured and developed from granite renders the land to immense erosion, after mining dugouts and deposits of chemicals used in extracting gold. Pits left un reclaimed are breeding mosquitoes. This calls for pragmatic measures to curb the environmental problems through educating and sensitizing the people vigorously to let them know their own existence is threatened.

Institutions that play supervisory and monitoring roles must be resourced enough to effectively ensure the right mining practices.

All over the developing world, existing literature which largely have informed policy on ASM have dwelt so much on the negative impact of the sector to the detriment of the fact that ASM has been of help to many poor economies and hope to a lot of very poor people. Although it will be practically out of place to deemphasize the negative aspects of ASM, it is equally disillusioning for the developing world to turn its back on a sector that has alleviated many of its people from dehumanizing deprivation.

More essentially, the rural poor as was gathered in the survey, perpetuate the negative side of ASM such as depositing silicon, mercury and other harmful chemicals on the land and water bodies during processing of gold ore thereby polluting water bodies and defer- tiling agricultural land, amidst human death, fatal injuries from collapsed pits, because of minimal formal education, low skills and crude technology, among others.

Therefore the fact stands that, if government offers financial support for the acquisition of machinery and on the job technical training, coupled with stringent supervisory and regulatory regimes, the negative sides of ASM especially to the environment and more essentially to the ecosystem will reduce immensely.

A platform must be offered the ASM practitioners and communities to dispassionately discuss the issues on ASM in the social and institutional context of the communities, in order that there may emerge an acceptance of the sector through affirmative resolutions and actions and set the foundation upon which managing and realizing the full potentials of ASM and minimizing its debilitating impact can be realized.

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