SMALL SCALE MINING IN WEST AFRICA
AND ENVIRONMENTAL SECURITY: THE
CASE STUDY OF TARKWA IN GHANA

BY
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(10505018)

THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY
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REQUIREMENTS FOR THE AWARD OF THE MASTER OF
ARTS DEGREE IN INTERNATIONAL AFFAIRS

LEGON
DECEMBER 2013
DECLARATION

With the exception of the quoted references and acknowledged sources, I hereby declare that this dissertation is a result of an original research conducted by me under the supervision of Dr. Ken Ahorsu and that no part has been submitted anywhere else for any purpose.

.................................................... ............................................
CAMARA KINANYA ALAIN                                          DR. KEN AHORSU
(STUDENT)          (SUPERVISOR)

DATE: .................................... DATE: ......................................
DEDICATION

This dissertation is dedicated to my family – Mrs Annick my wife and children, Grace Oriane and her sister Lauryn Hanniella.
ACKNOWLEDGEMENTS

To God be the Glory for helping and supporting me throughout my entire Course including this dissertation. I am also very grateful to my supervisor, Dr. Ken Ahorsu for his timeless dedication and great contribution during the supervision of this dissertation.

Special appreciation and thanks to all my colleagues at LECIAD whose company I enjoyed so much during our period of study. I also thank Mr. Abubakari Zakari and Aisha Osman for their immense support in gathering data for this work. I would like to also express my sincere thanks and gratitude to all my lecturers and the entire staff of the Ghana Armed Forces Command and Staff College for making the learning environment conducive for me.
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<tr>
<td>ECOWAS</td>
<td>Economic Community of West African States</td>
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<td>EPA</td>
<td>Environmental Protection Agency</td>
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<td>ERP</td>
<td>Economic Recovery Programme</td>
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<td>FDI</td>
<td>Foreign Direct Investment</td>
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<td>GDP</td>
<td>Gross Domestic Products</td>
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<td>GLSS</td>
<td>Ghana Living Standard Statistical Survey</td>
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<td>HIV</td>
<td>Human Immuno-Deficiency Virus</td>
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<tr>
<td>ICT</td>
<td>Information and Communications Technology</td>
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<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
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<tr>
<td>KVIPs</td>
<td>Kumasi Ventilated Improved Pits</td>
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<td>MDG</td>
<td>Millennium Development Goals</td>
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<td>MMDAS</td>
<td>Metropolitan, Municipal, and District Assemblies</td>
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<td>NGOs</td>
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<td>PMMC</td>
<td>Precious Mineral Mining Commission</td>
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<tr>
<td>PNDCL</td>
<td>Provisional National Defence Council Law</td>
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<tr>
<td>SAP</td>
<td>Structural Adjustment Programmes</td>
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<td>SSA</td>
<td>Sub-Saharan Africa</td>
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ABSTRACT

The activities of small scale miners in West African countries such as Ghana to a large extent have had negative effects on the environment and this has hampered security within the environment. The dissertation seeks to assess the effects of small-scale mining on environmental security in the Tarkwa-Nsuaem Municipality. Small scale mining operations have been a major cause of most of the negative environmental impacts in most West African mining communities in general and Tarkwa Nsuaem in particular. The environmental effects of small scale activities are higher because most of the activities are not coordinated and monitored by authorities. The methods of mining applied by mining operators determine the severity of the threat to environmental security. The chemical method of processing gold is, for instance, a severe health hazard, especially the amalgamation with mercury and heap leaching. Small scale mining activities have a lot of negative impacts on agricultural activities, the major occupation and source of livelihood for the people. These challenges in a fundamental way translate into social conflicts and misunderstanding in the mining communities. It is recommended that Government and its agencies should encourage the illegal small scale operators to formalize their operations in order to be accessible for supervision, coordination and monitoring. The issuance of licenses and permit for surface mining should be reduced and most of these companies should be encouraged to explore the underground mining method with appropriate techniques and skills that meet international best practices. The Tarkwa-Nsuaem Municipal Assembly should enforce environmentally friendly bye-laws and comprehensive environmental protection measures. The government and the Tarkwa-Nsuaem Municipal Assembly should establish laws and by-laws on the mining activities in the municipality in order to allow most part of the forest and vegetation to be reserved for agricultural purposes especially for both food and cash crop cultivation. The mining communities’ concerns must be identified and acted upon.
CHAPTER ONE

RESEARCH DESIGN

1.1  Background of the Study

Mining of minerals has been one of the world’s major occupations in modern times. According to Monika Weber-Fahr and John Strongman, large-scale mining generates about 85 percent of the world’s nonfuel minerals and more than 95 percent of the world’s total mineral production.¹ The mining industry in Africa has largely been transformed from a fragmented industry characterized by small-scale operations to one dominated by a relatively concentrated group of multinational corporations managing massive operations in increasingly remote areas.² This notwithstanding, the current surge in small scale mining in Africa, popularly known in Ghana as “Galamsey,” cannot be underestimated. By 2008, for instance, over 650 registered small scale mining groups were engaged in the mining of gold, diamonds and industrial minerals in Ghana.³ This increasing scale and intensity of small scale type of mining operations have not gone unnoticed and unconcerned by the communities that host them. These communities – often rural, indigenous and poor – are particularly vulnerable to the environmental and social impacts generated by the miners.⁴

The activities of small scale miners in developing countries such as Ghana to a large extent have had major effects on the environment. The security and very survival of the environment have been issues of concern. The most affected resources have been water bodies and forest resources. As a result, mining community conflict ostensibly arises due to grievances with mining operations. This may take the form of disputes over the relative distribution of costs and benefits,
decision making process, the control of the resources under extraction, or competition for the 
broader social and environmental landscape resources that community and miners may utilize.\textsuperscript{5}

The Western Regions of Ghana is widely regarded as one of the hotspots of small scale mining. 
Tarkwa, the area selected for this study is home to significant mining activity, mainly on gold, 
bauxite, and manganese. It is one of the communities most affected by activities of small scale 
miners in Ghana.

1.2 Statement of the Problem

The current spate of illegal small scale mining in developing countries such as Ghana has long 
been serious concern for both citizens and policy makers. In most cases the environment is the 
greatest casualty of small scale mining. The commonest in Ghana is the pollution of water 
resources, depletion of forests and the degradation of arable land. Residents of the various 
communities where these mining activities take place eventually bear the brunt of those 
activities. The living standards of those residents are adversely affected resulted in further 
perpetuation of poverty.

The Ghana Living Standard Statistical Survey (GLSS report 2008) indicates that more than 40 
percent of Ghanaians in rural, urban and peri-urban centres especially children die each year 
from diseases associated with unsafe water, inadequate sanitation and poor hygiene. According 
to the report, on the average, women and children walk a distance of six kilometres each day 
carrying 20 litres of water. Surface mining, including artisanal mining affects water availability 
to people through the use of large volumes of fresh water for processing as well as water
pollution from discharged mine sewage and outflows. Increasingly, human activities such as mining threaten the water sources on which human beings depend. James Lyon describes Water as "mining's most common casualty."^6

The unsafe living and working conditions caused by small scale mining activities do compel the people living in the environs of mines to protest and demand equal opportunities for living. In essence, threat to the security of the environment in the case of water pollution, forest depletion and degradation of arable land has the potential of causing conflict between miners and residents. Though there has been considerable number of studies in this area, little indeed has been done to investigate the relationship between environmental security challenges and conflict generation in small scale mining communities in West African countries such as Ghana.

It is, therefore, imperative that a research be done to assess the effects of small scale mining activities on the environment and the role of those activities in generating local conflicts within the Tarkwa-Nsuaem Municipality as a representation of small scale mining communities in West Africa.

1.3 Objectives of the Study

The broad objective of this dissertation is to assess the effects of small-scale mining on security and conflict generation in small scale mining communities in West Africa. In line with the broad objective, the specific objectives to be addressed by the dissertation are as follows:
• To identify the general impact of mining activities on security and conflict generation in West Africa.
• To analyse the methods of mining activities employed in the mining localities in Tarkwa.
• To identify the negative effects of small-scale mining on farming activities in Tarkwa.
• To analyse the health hazards caused by mining to the local communities in Tarkwa.
• To examine the role of small scale mining on conflict generation in Tarkwa-Nsuaem Municipality

1.4 Hypothesis

Environmental insecurity resulting from small scale mining is a potential source of conflict in West Africa.

1.5 Significance of the Study

Mining activities are indispensable in the economic development of most West African countries. This is especially significant considering the sub-region’s endowment with mineral resources. Ghana relies on the mining and extractive sector as one of the most important sources of revenue generation for development. The mining sector including small scale mining creates employment. It also contributes largely to the country’s GDP and generates substantial foreign exchange for the country.
Despite all these positive contributions, mining activities in general and small scale mining in particular cause greater negative effects, including environmental and health effects associated with mining activities, which can easily lead to conflicts. The study will, furthermore, be relevant to future researchers in this field of study apart from the fact that it will be a relevant document for policy makers in the attempt to ameliorate the negative impact of small scale mining activities.

1.6 Scope of the Study

The research work focuses on small scale mining in developing countries but with specific reference to the Tarkwa mining communities in Ghana. It assesses the methods and activities of these small scale miners, how they affect the environment and how those activities serve as sources of conflict in the community.

1.7 Conceptual Framework

The environmental management theory involves the processes, tools, and institutional arrangements that are devised and implemented that shape how people interact with the nature and its resources. The theory of environmental management and resource is often developed to secure and protect the natural resources which are needed for human survival, growth. It is also to address or prevent problems that are created or are likely to be created through human use of natural resources and thus set to control and mitigate the harmful effects that could be detrimental to human and plant survival in the ecology.
In recent times, the environmental management theory has been categorized into four main groups to show firstly those who classified environment as anthropocentrically ethical issue, secondly those who classified it as a means of exploitation for financial gains, thirdly, those who see the environment as being determined by its quality, and lastly those who maintain the idea that the environment must be made compatible with industrial activities through reduction of harmful waste.  

From synthesis of the theory, one can define the impact of human activities on the environment to include the impacts on biophysical environments, biodiversity, and other resources. Mining activities in general have been observed and to cause environmental insecurity for human survival whereby natural resources in the form of minerals are exploited for financial gains. Whilst others seem to make their exploitation compatible with the environment by taking precautionary measures to reduce the impacts, others still concentrate on the gains without thinking about the side effects to the ecosystem.

Environmental management, according to Paul C. Stern, is defined based on the impact of human activities including mining. The human behavior towards the environment is the extent to which it changes the availability of materials of natural resource from the environment or alters the structure and dynamics of ecosystems or the entire biosphere. For Paul Stern, the impacts of human activities such as mining which is causing environmental insecurity today has largely been a by-product of human satisfying his desires.
This concept of environmental management can best be used to explain the impacts of small scale mining on the environmental security. In this case, it is clear from the theory that small scale mining companies whether legally registered or operating illegally as the case of galamsey, the principal environmental problems they cause through the use and application of mercury especially for gold mining is as a result of satisfying the desires for profits and other financial gains. In this quest for satisfying human desires, mercury amalgamation technique is relied upon heavily as it is considered to be cheap, dependable, portable operation for concentrating and extracting gold from low-grade ores.

This concept moves in tandem with the concept of community management of natural resources. The community management of natural resources applies to the coordination of work efforts with the voice of each actor within the community becoming unavoidable in the management of a common resource. Applying this to this work implies that the miners, the farmers and the local communities will put their ideas together for a solution that would allow the various activities to be run while preserving the harmony of the whole community.

Dilys Roe, Fred Nelson and Chris Sandbrook posit that community management of natural resources has the potential to develop more sustainable natural resource governance regimes and to enhance local economic benefits. It is also an important strategy for pursuing the goals of various multilateral environmental treaties, such as the Convention on Biological Diversity (CBD), the Convention to Combat Desertification (UNCCD) and the UN Framework Convention on Climate Change (UNFCCC).10
There remain, however, relatively few cases of communities obtaining formal authority over lands and the natural resources found on those lands. Centralized control over natural resources persists despite the ever-present change in the rhetoric over land and resource management. In some cases, trends point more towards central consolidation of the right to use and allocate valuable resources such as wildlife, mine reserves and timber.\textsuperscript{11}

Furthermore, conflicts between local groups and other more powerful actors, including both state agencies and private sector investors, remain widespread across the sub-continent and are often intensifying. There are strong political economic incentives for political elites and central bureaucracies to consolidate their control over natural resources.\textsuperscript{12}

Further, conflicts arise from differences in perceived priority management objective – the most appropriate scale at which to manage from an ecological perspective rarely tallies with the most appropriate scale from a social or economic perspective. Similar challenges apply at the local level, when local governance institutions are not downwardly accountable to the community and benefits are disproportionately captured by local elites. Tensions exist in some places between the development of locally accountable governance and traditional authorities.\textsuperscript{13}

The concept thus demands that activities of humans, including mining should pay particular attention to environmental security. Thus, before any activities or operations are carried out, mining operators should first think about how to avoid or mitigate the impacts of the activities from exerting either temporary or permanent harms to the physical environment and the communities which bear the brunt of mining activities. It is also expected of the Mining
organizations to incorporate environmental considerations into their activities in order to eliminate or reduce the impacts of their activities on the natural environment for security.

1.8 Literature Review

According to Daniel Schwartz and Ashbindu Singh, notion that disputes and violence can erupt over access to resources appears as a commonplace subject. That the link between environmental resources and the outbreak of communal conflict has been recognized for decades. What separates modern day analysis on environmental conflicts, however, is recognition of the role that population growth plays in fomenting conflicts the distinction between non-renewable and renewable resources. Post-1970 works on “environment and conflict” emphasize the role that population growth plays in engendering resource scarcity.14

He distinguishes between direct and indirect natural environmental conflicts. Direct conflict refers to conflict over renewable resources that arises because of direct competition between two or more parties for the control and/or access to these resources while indirect conflict is the conflict that arises when renewable resource scarcity interacts with one or more social/economic factors to elevate friction within or between states. When this occurs, environmental factors are only one factor exacerbating and/or interacting with other social phenomena such as poverty and ethnic tensions.15

Indirect intranational conflict” occurs when environmental factors such as soil erosion, agricultural contamination, and water pollution, exacerbate and interact with other societal problems such as poverty, ethnic cleavages, mass migrations, and an uneven distribution of political and economic resources. Researchers have also demonstrated the link between the spread of micro-organisms and infectious disease (emanating from deteriorating environmental conditions), and the physical and socio-economic health of populations.19 The result of these volatile combinations is often intranational violence which could take the form of revolutionary insurrections, ethnic violence, urban crime, or state-sponsored civilian repression.16
Dalby Simon argues that what is mostly termed as environmental conflicts are often not really environmental conflicts. For him, it is rather the imposition of centralised state resource projects that often either cause or aggravate matters precisely because of the forms of property enclosure involved which dispossess subsistence farmers and disrupt nomadic modes of living.\textsuperscript{17} modern state's mode of rendering problems legible and manageable frequently cause disruption and resistance that is then defined as environmentally-caused violence. Nonetheless, the fact that environmental disruptions are sometimes related to political violence seems unavoidable.\textsuperscript{18}

His argument is based on his caveat that abundance and scarcity are geographically as well as politically located. In this context the abundance or scarcity of resources as a source of violence argument is misconceived. Both are clearly related to violence in some circumstances; but the issue is under what circumstances and at which geographical scale. It is not clear that the forms of violence and the political arrangements that lead to polarisation, mobilisation and overt conflict are necessarily likely to be similar; the literature on the new resource wars suggests that overt violence in the form of civil war may result from competing attempts to gain control over resource rents.\textsuperscript{19}

There is little evidence of an exactly analogous form of violence in the case of struggles over agricultural land or nomadic grazing lands. In the case of some commercially exported foodstuffs and shrimp 'farms' may be the best example, violence is related to the export trade and dispossession of traditional uses of land and water are involved; but the case studies of this issue do not suggest violence on the scale of civil wars analogous to diamonds in Sierra Leone, timber and oil in Angola or oil in the Sudan. Indeed, attention to the ecological and political-economic specificities suggests that environmental security is not an appropriate way to think about resource wars at all.\textsuperscript{20}
For Dalby, the construction of the relationship between violence and resources needs much more “nuanced geographical imagination to incorporate the general assertions of causality into the practical realities in different places.” Abundance and scarcity may be concepts that matter in terms of discussing the largest scale and the most abstract dimensions of the human condition. But practical relevance to either detailed scholarly research, or policy advice for states or international agencies, require so much more specific focus on particular contexts and the geographical connections between resource extraction and exports to the urban markets of the global economy.

In seeming agreement to Dalby Simon’s position, Abiodun Alao argues that natural resources have entered the dynamics of conflicts in West Africa because the mechanisms for governing these resources in most countries in the region are deplorably weak. By natural resource governance, Alao refers to the:

Complex structures of considerations, internal and external, which come to play in the management (i.e., the ownership, extraction, processing, distribution and control) of natural resources. This include the role of constitution in natural resource management, the politics of revenue allocation, the process of distribution, indigenisation policies and the politics of expatriate involvement in the ownership, management and control of natural resources, property rights, human rights concerns, the relationship with global market demands, and the complexities of managing environmental issues relating to resource extraction.

He enumerates various factors as the root causes of natural resource related conflicts in West Africa. One important factor, according to him, is the changes in the nature of balance of power. More often than not, problems have emerged when ethnic communities that had been allocated land and had thus been playing second-fiddle positions to their ‘land-lords’ suddenly assume important positions in national politics and eventually exploit that position to seek greater autonomy from groups that have historically being their ‘landlords’. The Nanumba-Kokumba
conflict in northern Ghana is a classic example of this. The Nanumbas, who had, historically, been considered as ‘tenants’, were able to attain a level of importance in education. Consequently, they challenged the historical dominance of their erstwhile masters over land and chieftaincy rights, and the result was a major conflict that ultimately necessitated the involvement of the Ghanaian military.\(^{25}\)

Elite manipulation, according to Alao, is another major cause of conflict over natural resources in West Africa. Elites come into the scene to exploit it to their advantage. Indeed, in all the communal conflicts identified above, prolongations of tension have been linked to elite manipulation.\(^{26}\) Another major cause of natural resource conflicts in West Africa is youth vulnerability. The youth have often been at the forefront of most of the natural resource related violence in West Africa. A good example is the Niger Delta region, where many of the ethnic conflicts over oil have been fought mainly by youths.\(^{27}\) The youths in this case feel hopeless at the downward thrust of their economic fortune and disappointed at the ways the older generations have handled national affairs, including the management of natural resources, this makes them assume violent disposition.\(^{28}\)

Paul Collier argues that the dominant factors in African civil wars are economic. He identifies three factors that matter a lot for the risk of civil war: the level of income, its rate of growth, and its structure.\(^{29}\) He argues that “If a country is poor, in economic decline, and is dependent upon natural resource exports, then it faces a substantial risk that sooner or later it will experience a civil war.”\(^{30}\)
According to Collier, one most important reason why natural resources precipitate local conflicts in Africa is that they provide an obvious source of finance for rebel groups. Even if the rebellion is not motivated by these crave for resources, it is greatly facilitated by them: from the proceeds leaders can purchase arms and pay recruits.

Warfare is a costly business: whereas thirty years ago rebel groups largely had to depend upon a friendly government for finance and armaments, now rebellion has been ‘privatized’ – markets in natural resources and armaments have developed to the extent that rebel groups can be self-sufficient. Rebel groups gain access to natural resource rents in several ways. One is to run protection rackets against the companies or people who are the exporters. Another is directly to operate extractive businesses. Yet another is to sell concessions to mineral rights in anticipation of subsequent control of the territory. The prolonged viability of UNITA in Angola and the RUF in Sierra Leone; the violent gangs of the Nigerian Delta; and the successful rebellions of Laurent Kabila in Zaire and of Denis Sassou-Nguesso in Congo Brazaville, were all assisted by one or the other of these methods of natural resource financing.

Robert Kaplan argues that the future of Africa will be that of communal survival, caused and aggravated by environmental scarcity. Collier’s argument is in contrast to Dalby Simon’s position that environmental security is not automatic a source of conflict but rather depends on the contextual and managerial dynamics. Kaplan, however, argues that these environmentally driven wars are sub-national in nature making it hard for states and local governments to protect their own citizens physically.

West Africa is becoming the symbol of worldwide demographic, environmental, and societal stress, in which criminal anarchy emerges as the real "strategic" danger. Disease, overpopulation, unprompted crime, scarcity of resources, refugee migrations, the increasing erosion of nation-states and international borders, and the empowerment of private armies, security firms, and international drug cartels are now most tellingly demonstrated through a West African prism.

Kaplan argues further that the stress on the environment and natural resources that will result in the violence is a result of over population. He attributes West Africa’s over population to traditional practices in the sub-region, key among which is polygamy. Robert Kaplan’s main
argument is that the lack of self control by the African and the inability to tame the animist qualities is the direct result of the environmentally associated conflicts.

In Sierra Leone, as in Guinea, as in the Ivory Coast, as in Ghana, most of the primary rain forest and the secondary bush are being destroyed at an alarming rate. When Sierra Leone achieved its independence, in 1961, as much as 60 percent of the country was primary rain forest. Now six percent is. In the Ivory Coast the proportion has fallen from 38 percent to eight percent. The deforestation has led to soil erosion, which has led to more flooding and more mosquitoes. Virtually everyone in the West African interior has some form of malaria.  

Jodi Rosenstein argues that the role of oil, gas and the mining sectors in West Africa has become increasingly more controversial. The controversy stems from the fact that countries in the developing world that possess significant oil and mineral wealth continue to suffer from crushing poverty. The governments have not been able to convert enormous rents into real improvement in the lives of their citizens. In Nigeria, for instance, 70 percent of the population lives in poverty despite the fact that the country has generated over 300 billion dollars in oil rents over the past 25 years.

He further argues that West African mining areas often overlap areas inhabited by indigenous people whose livelihoods depend on the land and other natural resources. These communities must shoulder the brunt of mining activities in terms of cost of externalities and yet the least to benefit from the venture. Moreover, these communities are often marginalised in the planning and management of process of mining ventures.

Jodi identifies different natural resources with different beneficiaries and, therefore, impact conflicts in varied ways. Unlootable resources require significant investment in technology and
skilled workforce. They require special transport facilities, therefore, making transportation costly and smuggling more difficult.\textsuperscript{39} Lootable natural resources, on the other hand, can be extracted and transported by unskilled workers, even by a solitary individual alone. The proceeds are able go into the hands of combatants and can be the source of funding during the conflict. It also often generates income for local communities as well. This classification therefore provides insight into the motivations of the combatants in a particular conflict.\textsuperscript{40}

This classification done by Jodi is very significant. Apart from the Nigerian Niger Delta conflict over oil which is an unlootable natural resource, almost all the other resources that have been the centre of conflict in West Africa have been lootable resources. Small scale mining is undoubtedly an aspect of lootable resources. It determines the circumstances under which a rebel group can profit from natural resources, be it during the conflict or after the peace is restored. It also explains why local communities would clash with small scale mining operators in West Africa. They can directly benefit from the resource.

\subsection*{1.9 Research Methodology}

The sources of the data for this study include primary and secondary sources. Primary data were collected basically by administration of questionnaires to various individuals and stakeholders in the mining community. Moreover, there were field observations at the mine sites and other areas to determine the effects of mining operations on the environment. Secondary data will sourced from books, relevant articles, journals and reports of researches and other relevant documents. The research makes use of both quantitative and qualitative data analysis methods for presentation and analysis of data.
1.10 Arrangement of Chapters

Chapter one constitutes the research design (Background of the study, statement of the problems, research questions, objectives, hypothesis, theoretical framework, significance of the study, scope of the study, research methodology and arrangement of chapters).

Chapter two is the overview of mining in West Africa and environmental security.

Chapter three is an assessment of small scale mining and its impact on the Tarkwa-Nsuaem Municipality of Ghana.

Chapter four is the presentation of summary, conclusion and recommendations.
END NOTES

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CHAPTER TWO

OVERVIEW OF MINING IN WEST AFRICA AND ENVIRONMENTAL SECURITY

2.0 Introduction

This chapter deals with the overview of the mining in West African economies with special emphasis on Ghana. It includes the environmental challenges that are associated with mining activities and some common issues that generate conflicts in this sector. The chapter is structured to highlight the following: the contribution of mining in West Africa, the mining sector of Ghana, challenges posed by mining activities on the environment, reforms in the mining sector, the legal and regulatory environment of mining activities and conclusion.

2.1 The Mining Sector in West Africa

West Africa is located on a favourable geological site in the African continent where it is very conducive for small scale mining since most of the minerals are found or mined by these small operators through shallow and surface mining. West Africa is covered with proterozoic greenstone containing gold deposit usually found in Birimian and Tarkwaian supra-crustal rocks stretching from west to east. The first Europeans in West Africa arrived in the late 1400s but their activities in the slave-trading overshadowed gold production for several centuries. In the late 1800s, the production of gold stepped in by the introduction of large scale mining in the then Gold Coast located at the south-east of the old Ghana Empire.

The mineral wealth especially gold and other ores deposits have drawn the attention of the world’s advanced countries to West Africa particular in the countries like Ghana, Burkina Faso,
Ivory Coast, Guinea, Senegal, Liberia, Sierra Leone, Mali and Mauritania. Small-scale mining has contributed a lot in the developing economies. It has a major impact on the employment situation in West Africa more especially in rural areas where only smaller numbers of alternative job opportunities exist.

The West African economy is one of the weakest in the world with Real GDP Growth Rate of 3 percent in 2009 decreased from 5.5 percent in 2008 and GDP Per Capita of about US$ 867. The Total External Debt to GDP ratio is high at 20.9 percent. West Africa’s trade and investment ties with emerging and developing economies are expected to intensify further in 2014. Research shows that the rising incomes and urbanisation are supporting growth of domestic demand, which helps to reduce the exposure to external economic shocks. As a consequence, increasing diversification, for example into services including mining, telecommunications and construction is expected to create a more solid growth profile.

West Africa currently pursues its healthy growth dynamic but unfortunately the security situation reinforces the uncertainty in the outlook. The evolvement of the macro-economic indicators is encouraging as a whole, but the social situation, devoted here to the issue of employment, remain a major challenge for the improvement in the living conditions of the people. Unemployment, especially of young people and women, remains high owing to the low structural transformation of economies but also as a result of the persistent inadequacy of training and employment.

Africa is continentally ranked by the US Geological Society as one of the largest reserve of mineral resources in the world and primarily acts as a major supplier of mineral as raw materials.
West Africa’s role played in these primary mineral exports to generate revenue through foreign exchange cannot be overemphasized. Research shows that West Africa and rest of Africa’s development is being enhanced and facilitated by the receipts of about 15% of the world’s investment in mining and explorations between 2000 and 2011. The mining sector contribution in west Africa includes exports earning of about US$ 150 billion in 2011 and US$.....billion in 2013. In 2012 Africa mineral exports to China alone constituted 16% of the total China’s import of mineral which worth about US$100 billion.\textsuperscript{7} Liberia’s economic growth in 2013 recorded marginal increase from 8.3 percent to 8.4 percent on account of increased mining activities\textsuperscript{8}.

The biggest challenge faced by the burgeoning mining sector in the West African region apart from country-specific political risk is the threat to environmental security. The environmental security is seriously threatened by the small scale mining operations including illegal operators through the excessive application of mercury for gold processing and excavation of the land surface causing degradation and erosion which deprive the local small farmers of their livelihood. These small miners as a matter of ignorance and lack of training apply mercury amalgamation technique which is seen and thought of as cheap, dependable and portable way of concentrating and extracting gold from low-grade ores.\textsuperscript{9} However, the chemical in excessive quantities cause human health hazards and is also deleterious to the ecological system.

The mining sector generally is argued to be a curse in West Africa because of the challenges encountered by the environment in the process of extraction. Besides, the expected benefit that is supposed to be accrued to the region could be achieved because of lack of capacity and financial resources to tap and refine the minerals internally, rent seeking, and weak regulatory institutions.
in West Africa. There is also resource nationalism issues bordering the mining sector as a result of lack of developmental projects including provision of basic community needs such as quality education, health facilities, housing, etc for the rural poor who think the resource belong to them being passed over by their forefathers.\textsuperscript{10} It is also believed that other challenges faced by mining in West Africa include the following: illegal mining, power supply, constraints on infrastructure, skilled labour, local content laws and land access.

2.2 The Contribution of Mining in Ghana

Ghana is situated on the west coast of Africa and is home to more than 100 ethnic groups. The main exports of the country are gold, cocoa and timber as traditional export and other commodities such as pineapple, garment and apparel, cashew nut, etc as non-traditional exports. Ghana is one of the fastest-growing economies in Africa and is well-endowed with natural resources. Ghana is one of the countries with a record of mining dating back to the colonial era.

The country is well-grounded and deep-rooted in the mining industry which was made possible due to endowment with substantial natural resources including mineral such as gold, bauxite, manganese, etc. in recent times, the Ghanaian mining industry has expanded tremendously in providing economic support to the country. This was made possible due to the liberalization of the economy especially the mineral and mining sector with re-structured institutions which caused comprehensive and attractive legal and institutional frameworks. These measures have helped in no small way to attract investments into the economy at large but particularly the mining industry, especially the gold sector.\textsuperscript{11}
In Ghana, the sector plays a vital role in the development of the economy. As the second largest producer of gold in Sub-Saharan Africa after South Africa, the country has experienced a significant boom in national mining over the last two decades. The industry sector of Ghana recorded a growth of 7 percent which led to an increased share of GDP from 27.3 percent in 2012 to a share of 28.1 percent in 2013. The 2013 performance of the industry sector was mainly on account of a 37.5 percent growth in petroleum activities, which fed into a 17.6 percent growth in the Mining and Quarrying sub-sector, up from 5.0 percent in 2012. Between 1983 and 1998, the mining industry brought approximately US $4 billion in foreign direct investment to Ghana.\(^\text{12}\)

Gold alone accounts for about 38 percent of the total merchandise exports and constitutes about 95 percent of total mineral exports and contributes 80% of total mineral revenue in Ghana.\(^\text{13}\) In 2002, minerals export amounted to US$894 million which constituted about 39 percent of total export earnings and US$ 2,346 million representing about 45 percent of total export earnings in 2008.\(^\text{14}\) The mining sector now contributes about 41% to the country’s foreign exchange and is one of the leading foreign exchange earners. Of the US$ 2,346 million in total mineral export income in 2008, gold as the highest contributor, accounted for US$ 2,246 million, constituting 95.7%, while the remaining 4.3% came from diamonds, bauxite and manganese.\(^\text{15}\)

Small scale mining sector has contributed immensely to the economy of Ghana by creating employment opportunities for the unskilled labour force found in the mining communities in Ghana and has contributed to the production of gold for increased export earnings for the country.\(^\text{16}\) According to the Precious Mineral Mining Commission (PMMC), Ghana’s small-scale mining sector has produced over US$117 million worth of gold and $98 million worth of
diamond product from 1989 to 2001. Though, there are no exact figures on the number of small-scale miners in Ghana, Aryee (2003) estimates that approximately 100,000 Ghanaians are legally engaged in small-scale mining. The illegal small scale operators called ‘Galamsey’ make monitoring and regulating challenging.\(^{17}\)

Kessey K. D. and B. Arko (2013) found that small scale mining contributes largely to socio-economic issues of the rural dwellers especially those firms with license and permit. The licensed small scale operators comprise both male and female in the proportion of 82% males as against 18% females in the sector. Small scale mining sector provides employment for youth in the rural areas. Registered small scale mining firms can employs about five to fifty persons. Major of the work force in the small scale sector are unskilled semi-literate mostly secondary school leaver.\(^{18}\)

### 2.3 Mining and Environmental Security

Mining is a major economic activity in many developing countries such as Ghana. Operations, whether small or large-scale, are inherently disruptive to the environment, producing enormous quantities of waste that can have deleterious impacts for decades. The environmental deterioration caused by mining occurs mainly as a result of inappropriate and wasteful working practices and rehabilitation measures. Mining has a number of common stages or activities, each of which has potentially-adverse impacts on the natural environment, society and cultural heritage, the health and safety of mine workers and surrounding communities.\(^{19}\)
The small scale mining activities, more especially gold, is extremely widespread in Ghana but the bulk of the activities tend to be concentrated within the greenstone belts which are mostly Birimian and Tarkwaian, and alluvial areas especially along the paleo-placer terraces of the Offin, Pra, Ankobra and Tano rivers and their tributaries. These locations which are spread across the Western and Ashanti regions of Ghana are currently facing serious environmental and socio-economic challenges. The environmental challenges which are mostly caused by small scale mining affect the ecosystem in terms of their effects on lithosphere, hydrosphere and atmosphere.

These environmental challenges are imposed by the small scale miners in the ecology due to lack of knowledge, education and training of miners, inefficient technology for mining; inefficient public administrative management, challenges in human control, economic limitations and human survival, lack of access to better techniques, lack of information on best practices, lack of control and enforcement of policies, non-implementation of environmental legislations and low capital base implying reduction in investment.\textsuperscript{20}

The major concern of the general public, international development organizations, non-governmental organizations including pressure group is about the intensive use of mercury in mining especially gold in developing countries especially in West Africa. Mercury is found to be highly toxic which generally can easily affect living organisms. Farming and fishing communities where mining activities are on-going with the use of mercury are always subject to neurological disorder resulting from the consumption of farm produce and fish catch poisoned by exposure to mercury in ecological environment\textsuperscript{21}. 

\textsuperscript{20} University of Ghana http://ugspace.ug.edu gh

\textsuperscript{21} University of Ghana http://ugspace.ug.edu gh
The small scale mining sector especially gold profoundly impose harmful effects on the environment in the form of land degradation and erosion. This is because majority of the small scale mining operators normally employ basic tools such as dredging boats, water pumps, pickaxe, shovel, mercury and of late excavator and therefore do not give the environment the necessary attention it deserves. This in effect causes more destruction to the ecosystem. There is therefore the need to support the small scale mining sector to make it economically viable to reduce poverty in the country by making it environmentally sustainable.\(^{22}\)

In Ghana several studies in mining towns have revealed that environmental problems such as land degradation, pollution and others are associated with mining activities. Mining in all respect exert adverse environmental impact by way of contaminating the ecological system. As the mining activities are causing land degradation and erosion, the intensive application of chemical for gold extraction leads to harmful effects on the environment.\(^{23}\) The surrounding environment of the mining intensive areas is seriously going through rapid degradation leading to profound decrease in other economic activities such as farming and fishing. There is a serious competition between mining activities and agricultural land use and this is affecting food production in the mining intensive localities.

Besides, there is destruction of the whole biodiversity and this is negatively affecting the land, water and air thus making the all environment unsecure and unsustainable for human survival.\(^{24}\) Most of the negative impacts on the environment seem to be permanent and almost endemic in nature in terms of their harmful effects\(^{25}\). For instance, Akabzaa and Darimani (2001) ascertained
that the mining activity has negatively affected the socio-economic situations of the people living in the mining communities. The environmental effects are so profound and intensive to the extent that the community could not generate revenue from mining operators to mitigate the problems created and to adequately support displaced communities and this led to other challenges including social and human rights issues.

2.4 Reforms in Ghana’s Mining Sector

The exploitation of natural resources such as gold, diamonds, bauxite, manganese, forestry products, copper, and oil are traditionally argued to play a vital part in a nation’s growth and development. Countries endowed with these resources are assumed to be able to transform their economies towards the path of ‘sustainable development’. Gold mining is one of the key areas of natural resources argued to have the potential of boosting a country’s economy through the attraction of direct foreign investment.

However, instead of propelling the social-economic development of a nation, many developing countries with abundant resources are confronted with the issue of ‘resource curse’. The existence of mineral resources in many third world countries have turned out to be curses rather blessings, as mining companies, governments and other actors siphon away their wealth leaving the sources of the wealth battling with plethora of economic hurdles which sometimes lead to social unrest and conflicts. For instance, many West African economies have enjoyed huge mineral resource windfalls since the late 1960s but the per capita GDP in the region is still among the lowest in the world.
Following the introduction of neoliberal policies of private sector-led development as the only way to recover from economic crisis, most developing countries, adopted the structural adjustment programmes (SAP) in the 1980s as prescribed by the Bretton Wood Institutions. Under these reforms, most SSA with viable sectors such as mining were pressurised into privatising segments of this sector as well as amending and reformulating mineral policies to attract foreign investors. This created many investment opportunities for multinational mining corporations. Ghana was among the first West African countries to embark on these neoliberal reforms and its mining sector received priority attention in the country’s Economic Recovery Programme (ERP) launched in 1983.26 This gave the impetus for reformulation and promulgation of the Mining and Minerals code of 1986.

The argument for the implementation of the SAP was that export promotion and private investment would help the economy and serve as the essential means to achieving economic growth and employment creation. It was further argued that given the average size of Ghana’s economy and the attendant limitations on domestic private savings the key to over all savings in order to enhance the export growth and private investments is through the foreign component by way of capital inflows including Foreign Direct Investment. Foreign Direct Investment was also expected to lead the way to external markets, serve as the means of technology transfer and the key to employment generation and income distribution in general. In effect, it is perceived as a critical vehicle for economic growth and development.

Ghana as a natural resource endowed country was desirous to achieve quick economic growth and development. This ambition pushed the country to go to the agreement with its creditors
such as the World Bank/IMF and other donors, who turned to the country’s precious minerals commodity particularly gold and have changed the investment laws in the mineral sector to enhance their attractiveness for FDI flow into the mining industry. As a result the World Bank/IMF led Mineral Sector Reform in 1986 was born which brought in significant FDI to the mining sector leading to a mining boom with increased national mineral output over the last two decades. Based on these reforms, “the country’s mining sector experienced a considerable investment boom and increased production. By the end of 1999, the sector had attracted over US$3 billion worth of FDI. The sector now accounts for more than 30% of gross foreign exchange earnings.”\textsuperscript{27} The small scale mining was not given the needed recognition to the extent that ban was put on this operation in Ghana until 1989 when the PNDCL law was instituted. The law in 1989 (PNDCL 218) reserved the small scale mining activity for nationals of Ghana and has defined 25 acres concession as land size for small scale gold mining activities.

In recent years, mining legislation in Ghana and other African countries has been relaxed, giving the countries less control over the mining industry. This has drawn increased interest from transnational mining companies, which have opened or reopened a number of gold mines. The government owns shares in these mines, which yield a small income. Local companies supply simple spare parts and provisions, but there are no linkages between the transnational companies and small-scale mining. In Ghanaian small scale mining sector, the enforcement of the nationalities of the operators and workers seems to have been overlooked by the government and its implementing agencies. Recently, some of the illegal small scale gold miners arrested in Ghana were from China, Nigeria, Mali, Burkina Faso and Niger. An Inter-Ministerial Task Force
formed by the government of Ghana flushed out illegal mining activities and deported about 5,000 foreigners engaged in illegal small scale mining in 2013\textsuperscript{28}.

At the end of 2006 new mining legislation was approved by the president of Ghana. The parliament had passed the laws in 2005 and the initial work on changing the existing legislation had begun as early as 2002, when the responsible ministry introduced the bill. The process was prolonged by lengthy, complicated political negotiations. There were intense conflicts of interest between the international mining companies, local Ghanaian owned companies, the local communities and politicians. In short, the problem was how to distribute the profits from the mining activities.

2.5 The Legal and Regulatory Environment of Mining Activities

Environmental security sensitization and awareness generation are usually carried out by international organizations being spearheaded by the United Nations Conference on Human Environment. These worldwide activities caused government of Ghana to include ecological protection in its developmental agenda for sustainability\textsuperscript{29}. The government of Ghana has put in place certain measures to mitigate the mining effects in order to ensure peaceful co-existence between the mining company and its host communities. For instance, the Minerals and Mining Law which provides the regulatory and legal framework of mining in Ghana was, inter alia, to promote as much as possible, peaceful co-existence between mining companies and their host communities. The establishment of regulatory agencies such as Environmental Protection Agency, Minerals Commission, Mines Department, Water Resources Commission, among others were to enforce the law and make it operational. However, the attention of the law was not on the
small scale mining operations and therefore made small operations illegal throughout the country.

In 1989 government lifted ban on the operations of small scale mining sector by promulgating the Small Scale Mining Law PNDCL 218. The ban on small scale gold mining was lifted in 1989 by passing Small Scale Mining Law, 1989 (PNDCL 218). Regulatory efforts by Ghanaian Government in the small scale mining sector witnessed different kinds of laws and policy since 1989. This was aimed at making small scale mining activities legal in order to support socio-economic development especially among the rural communities. Government commissioned the Precious Mineral Marketing Commission under the PNDC Law 219 to properly regulate and mainstream the small-scale operations into the economy by helping the sector to licence, sell and market the mineral products. Gavin Hilson argues that the government regularisation efforts generally improved and contributed positively to the small scale mining sector and to the economy.

However, it can be pointed out that various challenges including the licensing system still face operators in the small scale mining sector. The procedure for obtaining a licence is long and tedious with various forms required be to completed for submission to the government authorities before approval of license. Generally, the whole procedure of obtaining license for small scale mining activities can take over months up to a year. For this reason, Gavin Hilson claims that, government is crowding out the small scale operators as can be evidenced from the fact that the allocation of land by Government to large scale miners are done without due
consideration from small scale mining operators and this leave the small operators with little option but to mine illegally.\textsuperscript{32}

Currently the small scale mining is operated under the authority of the ministry of Mines and Forestry through the minerals commission since the promulgation of the Mineral and Mining Act (Act 703) 2006. The mineral commission has offices around the designated districts and localities of mining sectors, and a district small scale mining committee made up of the District Chief Executive or his representative as the chairperson, the Mineral Commission District Officer, one person nominated by the District Assembly, one person nominated by the Traditional Council, an officer from the Inspectorate Division of the Mineral Commission, and one officer from the Environmental Protection Agency.

\textbf{2.6 Conflicts in the Mining Sector}

The mining and extractive sector constitutes a significant and increasingly important share of exports and tax revenues for West Africa, and holds enormous potential to finance rapid infrastructure development and private sector socio-development projects needed for sustainable broad-based economic growth and poverty reduction.\textsuperscript{33} However, the expected benefit needed to be derived from the mining sector could hardly be achieved due to lack of transparency and accountability of leaders to the people. Most people living in the mining communities lack good source of potable water, quality accommodation and good health, sustainable employment, etc. This situation is making mining-related conflict to become a permanent feature of the political landscape in many developing countries including West Africa, where encounters between mining companies and local communities are increasingly characterized by public protest,
violent conflict and the notable absence of state intervention. Conflicts between large scale mining companies and local communities as well as small-scale miners over land and mining rights, compensations and taxes to the government are common and often lead to violent confrontations. It is believed that the problem is increasing due to the growing number of people who are forced to go into small-scale mining to maintain or improve their living conditions.

In the past two decades, metals mining has been transformed from a fragmented industry characterized by small-scale operations to one dominated by a relatively concentrated group of multinational corporations managing massive operations in increasingly remote areas of the developing world. The growing scale and intensity of modern mining operations have not gone unnoticed by the communities that host them. These communities - often rural, indigenous and poor - are particularly vulnerable to the environmental and social impacts unique to small-scale mining. Today, even in the absence of significant government regulation, reputational and competitive pressures are forcing mining companies to address these impacts, although efforts to do so are often thwarted by communication failures, mistrust and power inequity.

As the mining industry’s presence has grown in the developing world, so have the number of conflicts between mining companies and host communities. These conflicts are usually in response to three impacts often associated with mining operations: (1) loss of land and livelihood, (2) environmental degradation, and (3) human rights violations. In the developing world, host communities tend to be rural and poor, and their members – subsistence farmers, fishermen or ranchers – often depend on the natural environment for their livelihoods. For many local people, the arrival of a new mining operation means losing their land – either through
government expropriation or company negotiations in which they have little bargaining power – and thus their primary source of income.

Mining-related pollution that damages watersheds, rivers, lakes and related wildlife also fundamentally undermines the economic security and the health of local peoples. Finally, mining operations are sometimes associated with a range of human rights abuses and social ills. Company efforts to secure valuable mining equipment and minerals through the use of government or private security forces often leads to intimidation and violence against local people. The inflow of large numbers of male labourers to the host community can also bring with it higher rates of alcoholism, prostitution and violence against women.

Community-based natural resource management is a theory that is simply suggesting that theoretically gross roots and other people in the mining communities are vested the power to take their own decision and exercise their right to control and manage the natural resources such as the mineral, land, forest and water. In many mineral endowed countries in West Africa a process of decentralization is occurring whereby local ethnic or community groups are gaining increasing influence over the capitol, and are in many cases mounting their own independent campaigns against foreign investors working in the region. Effective liaisons can be established within these communities to promote the mining operators’ image, inform on activities, and notify of problems before relations become problematic. There is on-going education and sensitization of natural resource management by individuals and Non-Governmental Organisations such as WACAM in mining communities in West Africa especially Ghana, Senegal, Mali, and Burkina-Faso. Some advocacy Organisations are pushing and conducting advocacy on the need
to facilitate the efforts of the ECOWAS Commission to harmonise policies and guidelines in the mining sector of the West African sub-region.

The World Bank argues that mining sector has the potential to contribute greatly to socio-economic benefit in West Africa when the local procurement is given support. This can lead to increased access to business growth opportunities, increased stability and diversity of markets, and improvement of business capabilities, which are more beneficial to local businesses, entrepreneurs, and communities.

The largest environmental cost is the pollution from the use of mercury for the extraction of gold. Furthermore, the pits are mostly not backfilled when an excavation is left. This leads to erosion of the land and to accidents. Also, forests are cut down to make timber to support mine shafts and to provide wood for bonfires. Only few small-scale miners prioritise safety on the job. The work below the surface in tunnels and vertical shafts is especially dangerous. Tunnels and shafts often collapse. Besides accidents and mercury poisoning, one of the most important health hazards to small-scale miners is silicosis (stone lungs). This disease is caused by the inhalation of quartz dust. The dust is produced when gold-rich quartz veins are crushed, and is inhaled when a breathing mask is not used. Also HIV is common in the mining areas due to the combination of men far from their homes and many prostitutes following in the wake of any gold rush. Moreover, crime rates often increase considerably in the small-scale mining areas.\textsuperscript{35}
2.7 Conclusion

The chapter has sufficiently discussed the overview of the mining sector in general, laying emphasis on Ghana whilst drawing from experiences in West Africa. Despite all the contribution of mining into the economies of West Africa, it is highly threatening environmental security. The environmental challenges associated with mining activities were discussed in detail to show that inappropriate and wasteful working practices and rehabilitation measures are on-going. The environmental challenges associated with small scale mining affect lithosphere, hydrosphere and atmosphere. Mercury as a highly toxic element affects living organisms in farming and fishing communities around mining centres. Mining activities are causing land degradation and erosion, the intensive application of chemical for gold extraction leads to harmful effects on the environment which thus affects food production in these localities.
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CHAPTER THREE

ASSESSMENT OF SMALL SCALE MINING AT TARKWA-NSUAEM AND ITS IMPACT ON ENVIRONMENT

3.0 Introduction

This chapter generally looks at the Tarkwa-Nsuaem area which falls within the scope of this dissertation and presents analysis of data and for discussion. The rest of the following sections of this chapter are structured as follows: section 3.1 gives the background and profile of the Tarkwa-Nsuaem Municipality in terms of its location and size, population administrative structure, the economy of the area, the structure of the local economy of Tarkwa-Nsuaem Municipal. Section 3.2 makes presentation and analysis of Data, whilst 3.3 details the discussion of research findings in terms of methods of mining activities, negative impacts of small-scale mining on farming activities, health hazards of small scale mining, and small scale mining and conflict generation.

3.1 Background of Tarkwa –Nsuaem Municipality

3.1.1 Location and Size

Tarkwa is the capital of the Tarkwa-Nsuaem Municipality, which is found in the Western region of Ghana. Tarkwa and its surrounding villages are well known for gold and manganese mining where a particular vicinity has been named Tarkwa mine, which is a large open-cast gold mine located at the North-western part of the town, and with another vicinity in village called Nsuta manganese mine which is also located at the eastern part of Tarkwa Municipality. The Tarkwa Mine, for example is surrounded by eight villages, namely, - Abekoase, Huniso, Samahu Pepesa, Tebe, Akoon, Brahabobom, and New Atuabo.
With a total land area of 978.26 sq. Km., the Tarkwa Nsuaem Municipality is one of the 17 administrative MMDAs (Metropolitan, Municipal, and District Assemblies) in the Western Region of Ghana. Established by Legislative Instrument L.I. 1886 in 2008, it is located between latitude 4°5’ and longitude 5°5’ and shares boundaries with Prestea Huni-Valley district to the north, Nzema East Municipality to the west, Ahanta West District to the south and Mpohor Wassa East District to the east.

3.1.2 Population

According to the 2010 population and housing census, the total population of the Tarkwa-Nsuaem Municipality is 90,477 which comprise 48.43% female and 51.57% male. Out of the total population of the Municipality, about 56,013 form the economically active people with 29,215 and 26,798 constituting males and females respectively. A total of 34,454 of the municipal’s population is employed within different kinds of sectors. Number of people employed in the public sector (government workers) was 1,396, whilst private sector employment was split into 5,951 people in the formal sector and 26,942 people in the informal sector. The rest are 32 people and 133 people in the semi-public/parastatal and NGOs respectively.

3.1.3 Municipal Economy

The economy of the Municipality is made up of mainly agriculture production. About 68% of the entire active population is engaged in agricultural production whilst the remaining 32% find themselves in the area of commerce, private informal sector and hospitality industries. The major
economic activity is mainly agriculture. There are other supporting activities such as industry, commerce and others. Mining is the main industrial activity in the area.

Water and land are two most valuable capital for the people of Tarkwa. Inhabitants of Tarkwa rely on farming for food production and income generation. The crops grown include an assortment of vegetables, starches like maize, cassava and yams. Traditionally, the Western region has also been known for cocoa production as well as Palm Oil trees as the main cash crops. While local communities depend on land for their survival, large-scale mining companies rely on the same land for their mining activities. According to Akabzaa and Darimani (2001), considerable areas of land and vegetation in Tarkwa have been cleared to accommodate large-scale surface mining activities. His study on environmental impacts of mining in Tarkwa in 2001 showed that, surface mining concessions have taken over 70% of the total land area of Tarkwa. In Tarkwa and its communities, which is awash with mining activities has over 56% of its population residing below the poverty level. The illiteracy levels are an astonishing 67% and unemployment levels are high too.

3.1.4 Mining Activities in the Municipal

The Tarkwa-Nsuaem Municipality was carved out of the Wassa West district which is known for its rich mineral endowment such as gold, manganese and diamond. Mining activities, particularly gold mining has been carried out in the area for centuries. The gold mining activities include both large and small-scale mining. Some of the large scale mining companies are Goldfields Ghana Limited and Anglo Gold Ashanti, Iduapriem. There are many ASMs throughout the municipality.
Small scale mining is very common in the Tarkwa-Nsuaem Municipality as people form groups in small numbers in different ways which may range from family members, friends, or ethnic based to extract minerals for income. Most of these small scale miners operate through tailings of old or closed down mines as a source of ore in the mining communities around Tarkwa, including Bogoso. The washing and panning for alluvial gold along the banks of streams and rivers has been in practice in Tarkwa and its nearby communities for many years.

Most of the benefits made available to local communities either through compensation, resettlement fees, community development funds or projects under corporate social responsibility programs do not seem to be accessed by the majority.

3.1.5 Economic Infrastructure

In the aspect of roads, the Municipality has a number of them which are not in their best of condition but is being given the necessary attention. They include the Tarkwa– Bogoso road and the Tarkwa town roads. In spite of this there are other roads which are also in their best of condition. For instance, the Tarkwa –Takoradi road is 100% asphalt\(^3\). It is clear that most of the roads in the Municipality are not in their best of condition hence may hinder economic growth.

From the GLSS survey, about 45.2 percent of residents in Tarkwa and its surroundings either have toilet facilities for the exclusive use of their homes or for community use. There is significantly higher proportion of 53 percent of the residents without toilet facilities in the Tarkwa and its surrounding area (which is considered urban) and this may be due to the fact that the mining areas of interest were improvised slums, comprised of aluminium and galvanized
with zinc, shacks that fall beyond the provision of standard social services by the municipal authorities. According to GLSS, 58.3 percent of residents in Tarkwa and its surrounding areas have no access to potable water, whilst 40.2 percent have either shared or exclusive access to such water. Electricity provision, however, was very high among residents, rating as high as 75.6 percent for those with either shared or exclusive access. Only 22.3 percent said they had no electricity.\textsuperscript{4}

The educational infrastructure contributed by mining companies in the Tarkwa-Nsuaem Municipal include the construction of schools, construction of teachers quarters, construction of libraries and ICT centres in New Atuabo, Samahu, Tarkwa, Brahabobom, Pepesa, Akoon and Huniso. The health infrastructure in the municipality includes the construction of clinics and maternity wards in Tarkwa, New Atuabo, Samahu and Akoon.

Other infrastructural development are toilet facilities such as Kumasi Ventilated Improved Pits (KVIPs), water closets. KVIPs in some selected towns within the municipality, provision of refuse disposal facilities and construction of hand-dug wells, and small town water supply facilities, provision of electric transformers at New Atuabo, club house at Akoon and Construction of Community Centers in various towns.

3.1.6 Environmental disposition of the municipality

The natural environment of the Municipality which was once serene is now different due to the activities of miners. The mining activities of both the mining companies and illegal miners have degraded the natural environment and destroyed the ecosystem. The open cast method being
used now has had a devastating effect on the environment. Environmental and health effects of mining activities call for special services such as health care to deal with health problems that arise from mining and other activities.

Over the years, the recognition of the necessity of a functional relationship between mining companies and communities have not just been theoretical but as part of a broader development framework of sustaining communities and their environment. However, small scale mining operations tend to exert much environmental effects within the municipality than even the large-scale mining companies, because of the difficulties in monitoring the illegal small scale operators, normally in unapproved areas including river bodies and near residential areas.

3.2 Data Presentation
3.2.1 Questionnaire Findings

The survey questionnaire was designed in accordance with the objectives of the dissertation. The questionnaire was categorised into five main sub-headings. These five sub-headings were personal/bio-data, methods of mining activities, the negative impacts of small-scale mining on farming activities, health hazards of small scale mining, and small scale mining and conflict generation in Tarkwa-Nsuaem Municipal.

In general, 115 semi-structured questionnaires were distributed randomly to 78 respondents in the study area to solicit primary information and data in response in order to achieve the research objectives.
3.2.2 Background Data on the Respondents

Gender Distribution of Respondents: Out of the total number of respondent, 85 percent were males whilst 15 percent were females. The study found out that there were more males into active employment than females. This is highlighted in Figure 3 below.

![Fig.3: Gender Distribution](image)

Source: Author’s Survey Data

Age Distribution of Respondents: Figure 4 below presents the age ranges of the respondent. The average age of respondents is about 40 years. About 8 percent of respondents fall within the age range of 20 to 24 years. 19 percent fall within the age range of 25 to 29 years, 14 percent were found within a range of 30 to 34, 12 percent were found within the range of 35 to 39, 8 percent were within 40 to 44, 13 percent in a range of 45 to 49 whilst 12 percent, 10 percent and 5 percent in the ranges 50 to 54, 55 to 59 60 and above respectively.
**Fig. 4: Age Distribution**

<table>
<thead>
<tr>
<th>Age Ranges</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 and above</td>
<td>5%</td>
</tr>
<tr>
<td>55-59</td>
<td>10%</td>
</tr>
<tr>
<td>50-54</td>
<td>12%</td>
</tr>
<tr>
<td>45-49</td>
<td>13%</td>
</tr>
<tr>
<td>40-44</td>
<td>8%</td>
</tr>
<tr>
<td>35-39</td>
<td>12%</td>
</tr>
<tr>
<td>30-34</td>
<td>14%</td>
</tr>
<tr>
<td>25-29</td>
<td>19%</td>
</tr>
<tr>
<td>20-24</td>
<td>8%</td>
</tr>
<tr>
<td>15-19</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: Author’s Survey Data

**Marital Status of Respondents:** The marital status of the respondents, as present in Figure 5, indicates that about 40 percent were married whilst 51 percent were single and 6 percent and 3 percent were respectively widowed and divorced.

**Fig. 5: Respondents’ Marital Status**

- **Married**: 40%
- **Single**: 51%
- **Widow**: 6%
- **Divorced**: 3%

Source: Author’s Survey Data
Educational Status of Respondents: Table 2 presents educational level of respondents from the Tarkwa-Nsuaem Municipal area. 25 of the respondents attained educational level below Junior Secondary/Junior High School. 20 of them attained the level of Junior Secondary/Junior High School. 17 among the respondents attained Senior Secondary/Senior High School level whilst 5, 10 and one persons respectively had Diploma/HND, Bachelor’s Degree and Master’s Degree.

<table>
<thead>
<tr>
<th>Level</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below JSS</td>
<td>25</td>
<td>32%</td>
</tr>
<tr>
<td>Junior High School</td>
<td>20</td>
<td>26%</td>
</tr>
<tr>
<td>Senior High School</td>
<td>17</td>
<td>22%</td>
</tr>
<tr>
<td>Diploma/HND</td>
<td>5</td>
<td>6%</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>10</td>
<td>13%</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Doctorate Degree</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>78</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Source: Author’s Survey Data

Occupation of Respondents: 37 percent of the respondents were farmers whilst 26 percent were miners. Other occupations include 19 percent traders, 12 percent fishermen and 6 percent public service workers (see Figure 6 below).
3.2.3 Methods of Mining Activities

In order to find answers to the method of small scale mining activities employed in Tarkwa and its environs, some key information were obtained during the course of the primary survey. These have been analysed below.

Awareness of small scale mining in Tarkwa and its environs: the people living in Tarkwa-Nsuaem municipality, both natives and aliens were all aware of small scale mining activities going on in the vicinities. They seem to have knowledge about what is happening in the municipality in terms of mining and extraction and thus express the danger and possible outcomes on the environment within which they live. From the field survey all respondents claim that they have heard and seen small scale operations going on with groups sometimes made up of strangers from other places. Thus the awareness on small scale mining activities among the people is very high as presented in the Table 3 below.
Table 3: Awareness of SSM

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>78</td>
<td>100%</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Author’s Survey Data

**Knowledge of what constitute Small Scale mining:** From the field survey it came out that respondents gave different kinds of description to small scale mining which eventually converged on same point as defined in the literature. Small scale mining generally has come to mean subsistence mining whereby group of young people who are not officially employed pan for gold near rivers and streams side for livelihood. These groups of young people are usually found with basic hand tools. To some respondents, once excavators, bulldozers are applied to extract minerals, they see such activities as medium to large scale operations. In most cases, subsistence miners invade the areas where excavators and bulldozers have been used to clear and excavate the land during and after the operation for mining. In Tarkwa, there seem to be competition between the large-scale and small scale miners mostly where small scale operators exploit the concessions of the large scale miners.

**Illegal Small Scale mining Activities:** there are illegal mining activities ongoing in the Tarkwa-Nsuaem municipality. Two categories of small scale mining activities occur in the area. One category is the registered small scale operators and the other category is the unregistered ones who carry out mining activities without licences or any permit. The second category of miners is
referred to as the “galamsey”. The responses from the field indicate that there is high incidence of illegal mining activities. 68 percent of the respondents admitted that illegal mining activities are rampant as presented in the figure 7 below.

**Responses on the Methods of mining in Tarkwa and its Environs:** as already stated in the research questions, this dissertation wanted to find out whether the methods of mining applied by miners in the Tarkwa-Nsuaem Municipality have profound effects on the environmental security. The results indicate confirming the following type of methods of mining in the Tarkwa and its environs: surface mining, Underground mining, dredging, galamsey method, etc. (see Figure 8 below).

![Fig.8: Types of Methods of Mining in Tarkwa](https://ugspace.ug.edu.gh)

Source: Author’s Survey Data

**Effects of Small Scale Mining Method on Environment:** Mining and extraction activities generally were believed to have profound negative influence on the environmental security. However, the method of mining employed determines the intensity of the negative impacts on the environment. A majority of about 76 percent of the respondent were of the opinion that the
types and methods of the mining and extraction employed by the small scale mining operators in the vicinity contribute highly to the negative effects on the natural environment (see Figure 10). Small scale operators and their method employed lead to degradation of land and loss of vegetation covers, water pollution in the drainage systems of the municipality, air pollution and dust particles in the atmosphere, and sometimes noise pollution through the heavy sounds of the excavators and bulldozers where mining sites are close to human settle. 37 percent of the damages caused by small scale miners is water pollution, 31 percent is degradation of land and loss of vegetation, 15 percent is air pollution and 6 percent noise pollution whilst about 10 percent of the damages cause ailment and contaminations (see Figure 9 below).

\[\text{Fig.9: Effects of Mining on Environment}\]

Source: Author’s Survey Data

**Perception on Causes of land Degradation:** the respondents perceive that the causes of the environmental degradation in the municipality were the use of heavy machines such as bulldozers and excavators, clearing of the forests and the vegetation cover in general, long period
of extraction of minerals in the communities, and others such as surface mining (see Figure 11). The causes of the environmental pollutions were believed to be due to the presence of tailing into the water bodies such as rivers and streams, the use of toxic materials for extraction of minerals especially mercury, the use of heavy machines which sometimes cause most of the dust in the air in the form of air pollution, long period of extraction in the surrounding areas causing mercury and other poisonous substances to dissolve into the soil and come into contact with crops (see Figure 12).

![Fig.11; Causes of Land Degradation in Tarkwa](image1)

![Fig.12: Causes of Environmental Pollution](image2)

Source: Author’s Survey Data
3.2.4 Negative Impacts of Small-Scale Mining on Farming Activities

Mining activities especially small scale operations in the Tarkwa-Nsuaem municipality have proven to exert negative impact on agricultural activities in the area. The perceptions of the people are summarized below.

_Clearing and burning Vegetation:_ As a result of mining activities especially those activities which are carried out illegally, the environment is losing most of its natural vegetation. As part of the mining activities forests are cleared and burnt to give space for bulldozers and excavators to dig and scoop the soil deep down to minerals to be accessed. This has result in land degradation, deforestation and loss of top soils for agricultural purposes. Respondents of the filed survey have confirmed that most small scale-operators burn and clear the vegetation and dig for mineral-bearing ores in Tarkwa and its surroundings. 67 percent of the respondents have ascertained to this fact whilst 33 percent were of the view that not all small scale activities lead to burning and clearing of vegetation (see Figure 14 below).

**Fig.14: Clearing and Burning Vegetation**

Source: Author’s Survey Data
**Damage of Agricultural landscape:** Small scale mining operation can lead to destruction of the environmental landscape. As the miners excavate and dig pits and trenches, it renders the land unsuitable for farming activities. 87 percent of the respondents claimed that small scale mining activities cause destruction of the landscape to render it unsuitable for agricultural purposes (see Figure 15 below).

![Fig.15: Damaging landscapes](http://ugspace.ug.edu.gh)

**Source:** Author’s Survey Data

**Competition between mining and Farmlands:** Currently in the Tarkwa-Nsuaem Municipal, a stern competition is on-going between the small-scale miners/galamseyers and the farming communities for arable land. This fact was confirmed by 78 percent of the respondents as indicated in the Figure 16 below. In actual sense farming and other agricultural activities are seriously affected by dangerous activities of the miners in the Municipality. Some of these mining activities include tailing into water bodies, use of toxic materials, removal and excavation of the top soil on land using heavy machines, clearing of vegetation covers, which together lead to degradation and erosion.
Farmers deprived of farmland: In most cases farmers are being forced to sell their farm and the land to mining operators through the aid of the assembly, the traditional rulers and sub chiefs. This situation still ongoing in the Tarkwa –Nsuaem municipality further set to deprive the farmers with arable land for agricultural activities. 47 percent of the respondents states that farmers in the municipality have been deprived of farmland for farming, 33 percent do not support that statement whilst 19 percent do not know of such incident ongoing in the municipality as presented in Figure 17.
Addressing environmental issues: most of the respondents were of the view that the municipal assembly does not take environmental issues serious. According to them, the assembly does not undertake any proper steps to check and address the adverse effect of small scale mining on environment. Over 70 percent of the respondents claimed that environmental issues were not addressed by the Assembly whilst 27 percent claimed that the assembly put in place proper mechanisms in addressing such issues (See Figure 18). In terms of the respondents’ perception about the performance of the municipal Assembly, 58 percent perceived that the assembly performs poor whilst 27 perceived the performance to be very poor. However, 12 percent of respondents claimed that the performance of the assembly in addressing environmental impacts of small scale mining is good whilst 3 percent and 1 percent of the respondents respectively perceived that the assembly was performing very good and excellent as indicated in the Figure 19.
3.2.5 Health Hazards of Small Scale Mining

Small scale mining activities in the Tarkwa-Nsuaem Municipality have always been associated with environmental pollution and health hazards. A summary of the field survey is presented below.

**Environmental Protection Measures by Small Scale Operators:** Within the small scale mining sector, enforcement of environmental laws become difficult because of the operations of the illegal/unregistered small scale operators (galamseys). In most cases the small scale mining operators do not put in place measures to reduce or prevent environmental effects of their activities in Tarkwa and its surroundings. There are virtually no attempts to undertake measures to reduce environmental effects and to restore the environment. 85 percent of respondents have ascertained to this fact that small scale mining operators do not take any measure to protect the environmental effects of their activities (see Figure 20). The only reason answer on the field from a respondent is that, the measures taken to prevent environmental effects by some SSM is that they transport water to the mine sites to be used for tailing in the burn areas in order to
prevent it from going to the rivers. Even this measure is not also adequate to protect the environment from pollution and destruction as evidenced in figure 21.

**Small scale mining causes major health problems:** Small scale mining activities cause profound health problems especially through the use of mercury and cyanide in the amalgamation process to collect gold particles from sediments. This process leads to discharge of excess chemicals into the land and water resources. In figure 22, a total of 62 out of 78 respondents stated that small scale mining causes serious health problems.

Source: Author’s Survey Data
**Causes of Mining Pollution:** Most of the environmental pollution and health hazards are believed to have caused by activities such as the tailing, the use of toxic materials such as mercury and cyanides, excavation of land by heavy machines leading to degradation and erosion and the loss of vegetation cover through forest and land clearing. The tailing into water bodies in Tarkwa and its environs was perceived to contribute 42 percent of the environmental and health hazards, use of toxic materials such as mercury and cyanide contributes 39 percent whilst dust through excavation and clearing of vegetation were perceived to contribute 13 percent and 6 percent respectively (see Figure 23 below).

![Fig.23: Causes of Mining pollution](image)

Source: Author’s Survey Data

**The Danger of the Pits after Small Scale Operation:** 94 percent of the respondents believed the pits dug by small scale operators normally filled with stagnant water and serve as breeding grounds for mosquitoes and reptiles. This usually causes threat to human settlement in the vicinities.
**Diseases Causes due to mining Effects**: most people living in mining communities especially in the tarkwa-Nsuam municipal face a lot of health challenges including chronic diseases. A percent of respondents have ever suffered from mining related diseases (figure 25). The diseases usually contracted by people living in these communities include malaria, diarrhea, skin related diseases such as rushes, and other diseases like fever, lung problems, colds and catarrh due to the dust particles in the air (see Figure 26).

![Fig.25; Suffered Mining Causing Sickness](image1)

![Fig.26: Mining Related Diseases](image2)

Source: Author’s Survey Data

### 3.2.6 Small Scale Mining and Conflict Generation
A majority of over 80 percent of respondents claimed that the mining operations especially the small scale operators both legal and the illegal ones in most cases violate the rights of the people in the communities leading to deprivation of access to clean water from rivers and streams (see Figure 27). The rights to farmland for cultivation of both food and cash crops were also violated as alleged by about 70 percent of respondents (see Figure 28)
Most often conflicts and misunderstanding over trespass of concessions and over farmlands have been witnessed in the mining communities in the Municipality. Besides, misunderstanding also arises over bad treatment of local mine workers who often send their grievances to the management of the mining companies. This could be confirmed from Figure 29 as 53 percent claimed to have witness such misunderstanding in the area. Chinese nationals have as well on many occasion prevented local farmers from accessing their land due to mining operations in some communities in the municipality (see figure 30). There were also series of misunderstanding between large-scale and small-scale mining operators of concessions. Most often these small scale miners were locals from the communities.
As part of human rights abuse, people were prevented from confronting mining operators near the river-sides. The respondents expressed that mining-related pollution cause damages to rivers, streams and the related wildlife in the Municipality. It is believed that mining related pollution fundamentally undermines environmental security, economic security and cause health issues to the people in Tarkwa and its surroundings. It is also believed that mining operations were sometimes associated with a range of human rights abuses. As indicated in Figure 31, 86 percent of respondents declared that Small scale miners mostly violate and abuse human rights. Figure 32 also indicates that 83 percent of respondents asserted that mining related pollution to the water bodies in the municipality constitutes human right violation.
In terms of consultation between the mining operators and the rulers of the communities, over 90 percent of respondents declared that it is cordial and harmonious (see Figure 33). This sets to explain that the chiefs and elders of the communities most often consent to the bad practices of the small scale mining at the expense of their subjects for self gains.
3.3 Discussion of Findings
3.3.1 Effects of the Methods of Mining Activities on Environmental Security

Mining in general has negative impacts on the environment. However the intensity of the environmental impacts also depends on the type of mining method employed. There are generally three main types of mining methods, namely: Open cast surface mining; underground mining; and dredging.

The open cast/surface mining method basically refers to a method of extracting minerals from the earth by their removal from an open pit or borrows, which requires a large tract of land for its operations. Underground mining is the method of mining in which shafts are drilled with tunnels underneath the earth for extraction of minerals. This method of mining protects the fertile top soils on the surface of earth for agricultural activities and other land related uses because extraction activities are done beneath the earth. The dredging method simply refers to the method of mining in which shallow part of the water bodies such as rivers, streams, etc. are drilled and excavated for minerals.

The environmental effects of the surface/open cast and dredging methods are severe and intensive because they seem to be easier and cheaper than underground mining. The major problems of the surface/open cast mining stems from destruction of vegetation cover, destroying the landscape, the use of toxic chemicals and the waste disposal, leaching and water pollution through tailing. With dredging method which impacts similar negative effects, water bodies are disturbed rendering the water muddy and unsafe for drinking, cooking and washing. In the case of underground mining, almost all the extraction activities occur beneath the earth. Though the underground water could be contaminated beneath, it seems minimal than these other two
method because it protects the fertile top surface of the earth for other land use like farming and housing.

Both the large-scale and small scale miners operate the three main methods of mining above. The difference however is that, the small scale operators do not drill the shafts and tunnels of the underground method themselves but acquire them from large-scale operators after closure of such mines. Sometimes illegal small scale miners (galamsey) use the abandoned shafts unauthorized to mine for gold.

The environmental effects of small scale activities are higher in the Tarkwa and its environs because most of the activities were not coordinated and monitored by authorities due to illegal operators in this sector. Small scale mining either by opencast or underground methods damages the water regime and reduces the overall availability of water in and around the mining areas. In the sedimentary deposit mining areas, the water table and aquifers are damaged and the availability of water from these sources is substantially reduced.

In Tarkwa municipality open cast or surface method of mining is the most common among all methods. Surface mines demand large tracks of land to be excavated and in the process the clearing of vegetation and degradation occur. There is the need for a vast open space of land for surface mining which is in keen competition with other land uses especially agricultural activities in the municipality. Surface mining is also based on hauling and heap leach methods which have a gross demand and impact on land resources. Surface mining led to the relocation and resettlement of many communities in the Tarkwa_Nsuaem Municipal in the past. The reason
for resettlement was that larger space was need to develop mine sites where heap leach facilities, tailing dams, open pitches would have to be constructed.

Small scale mining techniques involve rudimentary methods of ore extraction and processing and their activities can have a severe impact on environmental security. The small scale mining processing method originally consists of crushing or grinding and these generate the combined wastes through extraction and milling known as tailings. After the mineral grains have been liberated, they can be physically separated using one of several methods: magnetic separation, gravity methods or chemical methods. The magnetic and gravimetric methods do not generally present environmental hazards, but the chemical methods are severe in generating hazards. This chemical method is rather the common method applied by small scale operators in Tarkwa Municipal because it seems simple, cheap and inexpensive. The most common chemical methods applied in the Municipality are flotation, capitation, amalgamation and heap leaching. These methods use large amounts of organic compounds, cyanide, mercury and acids, all of which need to be properly handled and are frequently found in the tailings. Small scale mining operators most often dump mining waste directly into rivers or streams as a method of disposal and this forms the worst water pollution offence in the vicinity.

3.3.2 Negative Impacts of Small-Scale Mining on Agricultural Activities

As already stated, mining is generally very destructive to the environment. It is one of the main causes of deforestation. According to the Tarkwa-Nsuaem Municipal Assembly, small-scale mining is reserved for Ghanaian nationals but the law allows foreigners to only supply goods and services to local mining operators. Because of that Chinese-made gold mining equipment has
quickly become popular in mining towns of the Municipality including Tarkwa. Thus, both legal and illegal small scale operators could walk in and acquire machines mostly through rentals from middlemen and go into mining operations. The Illegal miners account for the most significant part of the environmental damage among the small-scale miners. Legal small-scale miners must have environmental permits and are monitored regularly by field officers.

In general, whether legal or illegal, small scale mining activities are detrimental to agricultural activities in the Municipality. The main occupation of the people of Tarkwa-Nsuaem Municipality is subsistence agriculture, although rubber, oil palm and cocoa are also produced in high quantities. Mining which has become the main industrial activity in the area is depriving the local farmers of their livelihoods. Mining especially small scale mining operations interfere a lot in the agricultural activities. In order to mine, trees and vegetation are cleared and burnt. With the ground completely bare, mining operations use huge bulldozers and excavators to dig pits and trenches and upturn the vegetation to extract the metals and minerals from the soil. This thus leaves land bare and exposes to agents of erosion.

In order to amalgamate the extractions, the miners use chemicals such as cyanide, mercury, or methyl mercury. These chemicals go through tailings and are often discharged into rivers and streams. This pollution contaminates the water bodies around which is harmful to all living organisms within the water bodies and ultimately the people who depend on the fish for their main source of protein and their economic livelihood in the Municipality are greatly affected. Besides, farmlands are destroyed through excavation and clearing of vegetation covers, causing land degradation and erosion, thus making these farmlands inaccessible by farmers in
most part of the Municipality. In addition, the effects of mining activities on animal farming results when the animals are exposed to high levels of methyl-mercury and this leads to increased mortality, reduced fertility, slower growth rates, and abnormal behaviors that affect survival of these animals.

According to majority of respondents their main worry is the farmland loss which was almost widespread and usually claimed by mining operators within their concessions and thereby rendering the land useless for agriculture due to pits and loss of top soils. These activities of mining operators are making it difficult to find suitable land for farming purposes in the Tarkwa-Nsuaem municipality. Farmers in some communities in the Tarkwa and its environs are most often forced to sell off their farms to small scale mining companies and this further leads to destruction of land and water resources in the area to intensify. In such cases, the poor farmers are left with little or no option because movement of heavy equipment to mining sites causes considerable damage to their crops before chiefs and landowners prevail on them to negotiate the sale.

It is also well-known that the on-going small scale mining activities are detrimental to agricultural activities in the municipality and create negative impacts on the lives of many farmers through environmental degradation, damaging landscape, deforestation and erosion. The activities of small scale miners are environmentally damaging process to the extent that chemicals in the form of mercury and cyanide through amalgamations and tailings all of which destroy and pollute many water sources in mining communities. These activities have often rendered water bodies unsafe and undrinkable. Besides, contaminations in the water bodies kill
thousands of fish which is a vital source of food for many people in the area. The activities also contaminate the crops of surrounding farmland. In Tarkwa and its environs, it is quite common for prospective sites to be stripped bare of vegetation topsoil, and where deep underground mining has occurred, that pits and other trenches are left uncovered and abandoned thus, giving way for stagnant water to be harbored and serve as breeding grounds for malaria-infected mosquitoes and reptiles.

### 3.3.3 Health Hazards of Small Scale Mining as a Threat to Environmental Security

The major environmental impact of small-scale mining in Tarkwa Municipal apart from land degradation and erosion is the health hazards. As already indicated, the health consequences of the open cast/surface mining methods is highest as these methods depend on modern technologies of gold processing and amalgamation, usually through chemical processes which create a negative impact on the lives of those in affected communities in Tarkwa and its surrounding areas manifested through illnesses. Surface mining is an environmentally damaging process because of the heavy reliance on toxic chemicals including mercury and cyanide causing contamination of water in these communities thus causing skin rashes and other health problems.

There are a lot of incidences of pollution in different kinds on-going in the Tarkwa-Nsuaem Municipality generated through the mining activities especially the small scale operations, and most of these pollutions are related to the open cast/surface mining. Open cast method by small scale operators is often carried out with the use of heavy machines, highly toxic chemicals such as mercury and cyanide, and tailing into the drainage systems. These activities of the mining operators lead to substantial pollution water bodies in the form of chemical pollution of ground
water and streams, increased faecal matter and siltation of water bodies through increased sediment load in the municipality. This has in actual fact, rendered the rivers and streams undrinkable due to the risk of water born diseases including skin rushes.

The Tarkwa and its surrounding areas, the principal environmental problems caused by small-scale mining activity are mercury pollution from gold processing. The mercury amalgamation technique in high quantities is relied upon heavily as it is a cheap, dependable, portable operation for concentrating and extracting gold from low grade ores. This poses a serious threat to human health and as mercury is poisonous to a wide-range of living organisms such as bush animals. The small scale miners applied no prevention and mitigation techniques to avoid or reduce the impacts of their activities on health. The improper use and handling of cyanides and mercury therefore is threatening human and animal survivals and this makes the environment insecure. The chemical compositions of mercury and cyanide cause potential health hazards for miners and residents of the communities especially as they come into contact or when they are exposed to these chemicals through eating affected food or bush animals that might have been affected by eating affected plants through the food chains.

The mercury spills in the mining communities also caused health problems for people in these communities and also make the local water undrinkable due to high levels of toxic chemicals. People who mistakenly swim in the rivers and streams are also exposed to skin peel-off, whilst drinking of such polluted water and eating fish from them lead to serious stomach problems.
It is obvious as indicated earlier that, people who are exposed to the toxic waste from the tailings attract diseases. They develop skin rashes, headaches, vomiting, diarrhoea, malaria, and respiratory problems. In fact, the symptoms of mercury poisoning are believed to be very similar to the symptoms of malaria and can easily kill affected people. Many people in the mining communities affected with mercury poising and could not afford to go to hospital or clinic especially villagers, who live in very remote areas where accessibility is poor, are often not treated for their illnesses and in the end they lose their lives.

Health effects associated with mining activities are noteworthy. It is also obvious that there is high prevalent rate of diseases such as malaria, fever, diarrhea, respiratory infections such as cough, cold, catarrh, and other lung diseases, and skin diseases among residents which were direct and indirect effects of mining activities. High prevalence of malaria in the area is attributed to mosquito breeding from polluted water courses, tailings dams and other stagnant waters collected in holes and pits that are created as a result of mining activities.

Among the mining workers especially small scale operations, the most immediate health hazard of their activities on their lives is the respiratory problem because most of them do not have the proper technology and protective instruments. Besides, some of the workers are exposed to mine site injuries because safety issues are not properly ensured in most cases. However, the long-term impacts on these workers include skin and lung cancers, mental health impacts and genetic problems.
3.3.4 Small Scale Mining and Conflict Generation

When mining activities were usually carried out in the underground, the local level social conflicts between mine operators and local communities were reduced to a very minimum because surface environmental security was assured. This made it possible for the local people in the mining communities to take control over their land and to make use of their land for agricultural purposes. The issues of land encroachment, relocation and resettlement of communities were non-existent or very minimal.

In the 1980s and 1990s during mining sector reforms and liberalization regime, new methods of mining mostly open cast and dredging were introduced which required large tracts of land for such operation. As mining companies acquired concessions, most land owners and land users lost their lands to mining companies. Farmlands were converted into mining sites and these led to the genesis of the social conflicts and misunderstanding between local farmers and other land users on one hand and the mining companies and government on the other hand.

The surface mines require vast amounts of land and most importantly a small number of highly skilled labourers. The activities of both the mining companies and illegal miners degrade the natural environment and destroy the ecosystem, especially the open cast method being used now has had a devastating effect on the environment. Through this method, hills are graded down, vegetative covers of the soils are stripped and deep excavations are made out by taking the mineral laden soils. This leads to destruction of many cocoa farmers in Tarkwa and its surrounding areas.
In recent times, mining operators especially the small scale miners both legal and illegal ones in most cases violate the rights of the people in the communities leading to deprivation of access to clean water from rivers and streams. The rights to farmland for cultivation of both food and cash crops were also violated in some communities. Most often conflicts and misunderstanding over trespass of concessions and over farmlands have been witnessed in the mining communities in the Municipality.

In some part of the Tarkwa-Nsuam Municipality team of natives and other non-residents with non-Ghana nationals usually Chinese buy patch of land deep inside the villages to mine gold. This causes a lot of threat to natives who farm near those areas as these miners move in with excavators, wrecking farmland and turning the local stream into a trickle of mud, thus rendering it unusable for bathing, cooking or washing clothes because of contaminations and mud. This usually sparks anger and agony among the natives since their farmlands and source of water have been turned into mining sites by small scale operators. According to some residents of the Municipality, the small scale miners also operate big machines and it makes it very difficult to reclaim the land for farming when they exhaust the areas.

Local people are prevented from confronting mining operators near the river-sides. Mining related pollution fundamentally undermines environmental security, economic security and cause health complications for the people in Tarkwa and its surroundings. Mining operations have also been associated with a range of human rights abuses.
3.4 Conclusion

Small scale mining, whether legal or illegal, has fundamental impact on both environmental and social security. However, the illegal nature of “galamsey” and the fact that the operations elude monitoring, they are responsible for most of the challenges. The situation in Tarkwa-Nsuaem is a reflection of what is happening in most West African mining communities.
Endnotes

1 Wikipedia
2 Tarkwa-Nsuaem Municipal Assembly
3 Tarkwa-Nsuaem municipal Assembly
4 GSS GLSS 5
CHAPTER FOUR
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

4.1 Summary

The spate of illegal small scale mining in West Africa has long been serious concern for both citizens and policy makers. The common threat to environmental security were pollution of water resources, depletion of forests and vegetation cover, the degradation and erosion of arable land. The residents of the areas where the mining activities take place eventually bear the consequences of those activities. The Western Regions of Ghana has been one of hotspots of small scale mining, especially in the Tarkwa and its environs due to the presence of mineral such as gold, bauxite, and manganese.

The residents of Tarkwa-Nsuaem are fairly aware about the presence of small scale mining activities ongoing the area. 68 percent admitted there were lots of illegal mining activities in the vicinity and majority of about 76 percent ascertained that the type of methods of mining such as surface, underground or dredging mining in the Tarkwa and its environs determine the intensity of the negative impacts on environmental security. The causes of the environmental pollutions were believed to be due to the presence of tailing into the water bodies such as rivers and streams, the use of toxic materials for extraction of minerals especially mercury, the use of heavy machines which sometimes cause most of the dust in the air in the form of air pollution, long period of extraction in the surrounding areas causing mercury and other poisonous substances to dissolve into the soil and come into contact with crops.
Moreover, small scale mining activities exert lots of negative impacts on agricultural activities and this is believed to generate conflicts and misunderstanding between small scale operators and local farmers over farmland. A stern scramble for land exist between the small-scale miners/galamseyers and farmers. In most cases farmers are forced to sell their farmland to mining operators through the aid of the assembly, the traditional rulers and sub chiefs. As part of the mining activities forests are cleared and burnt to give space for bulldozers and excavators to dig and scoop the soil deep down to minerals to be accessed. This has result in land degradation, deforestation and loss of top soils and lead to destruction of the environmental landscape for agricultural purposes. Over 70 percent of the respondents claimed that the Municipal Assembly performs poorly in addressing environmental issues.

In addition the results portray that small scale mining activities in the Tarkwa-Nsuaem Municipality have always been associated with environmental pollution and health hazards. The small scale mining operators do not put in place measures to reduce or prevent environmental effects of their activities and cause profound health problems especially through the use of mercury and cyanide in the amalgamation process to collect gold particles from sediments. 94 percent of the respondents believed the pits dug by small scale operators normally filled with stagnant water and serve as breeding grounds for mosquitoes and reptiles. Most people are faced with various health challenges. Some of these include malaria, diarrhoea, skin related diseases such as rushes, and other diseases like fever, lung problems, colds and catarrh due to the dust particles in the air.
Finally, small scale mining activities generate social conflicts, misunderstanding and violation of human rights including the right to clean water and arable land for farming activities in the communities. Foreigners in the illegal mining operations sometimes use their influence to prevent local farmers from accessing their land due to mining operations.

4.2 Conclusions

The methods of mining activities applied by mining operators determine the severity of the threat to environmental security. The environmental effects of the surface/open cast and dredging methods are severer and intensive because they are carried out on the surface of earth and thus are directly exposed in the environment within which human beings live. Surface mining as a method leads to destruction of vegetation cover, destroying the landscape, the use of toxic chemicals and the waste disposal, leaching and water pollution through tailing. Dredging mining method has similar negative effects as the surface mining but further disturbs the aquatic systems and also renders the water muddy and unsafe for drinking, cooking and washing.

The small scale mining rely most on surface mining to generate the combined wastes through extraction and milling known as tailings. The chemical method of processing gold is the factor of the severe health hazards because this processing method is rather simple, cheap and inexpensive to use, especially the amalgamation with mercury and heap leaching and the waste are directly dumped into rivers or streams as a cheap way of disposal and this forms the worst water pollution offence in the affected areas.
Small scale mining activities have a lot of negative impacts on agricultural activities, which constitute the major occupation and provide livelihood for over 60 percent of the people. Small scale mining operations interfere a lot in the agricultural activities as these miners clear the vegetation cover with bulldozers and excavators which cause degradation of land to give way to agents of erosion. The chemicals discharged through tailings into water bodies cause water pollution, which is harmful to all living organisms within the water bodies and ultimately the people who depend on the fish for their main source of protein and their economic livelihood are greatly affected. The exposure of domestic and bush animal to high levels of methyl-mercury leads to increased mortality, reduced fertility, slower growth rates, and abnormal behaviors that affect survival of these animals.

Health hazards caused by the activities of small scale miners serve as a great threat to environmental security. The chemical processes which create a negative impact on the lives of the people in mining communities are manifested through illnesses because of the heavy reliance on toxic chemicals including mercury and cyanide causing contamination of water in these communities thus causing skin rashes and other health problems.

There are a lot of incidences of pollution in different kinds on-going in mining centres especially Tarkwa mostly generated through small scale activities. These activities of the mining operators lead to substantial pollution in the form of chemical pollution of ground water and streams, increased faecal matter and siltation of water bodies through increased sediment load, thus rendering water bodies undrinkable due to the risk of water born diseases including skin rushes. This poses a serious threat to human health and as mercury is poisonous to a wide-range of living
organisms such as bush animals. The small scale miners applied no prevention and mitigation techniques to avoid or reduce the impacts of their activities on health. The improper use and handling of cyanides and mercury therefore is threatening human and animal survivals and this makes the environment insecure. The chemical compositions of mercury and cyanide cause potential health hazards for miners and residents of the communities especially as they come into contact or when they are exposed to these chemicals through eating affected food or bush animals that might have been affected by eating affected plants through the food chains.

Small Scale Mining activities in most areas have been the cause of social conflicts and misunderstanding in the mining communities. As mining operators acquire concessions most land owners and users lost their lands to mining activities. Farmland is thus converted into mining sites and this leads to the social conflicts and misunderstanding between local farmers and other land users on one hand and the mining companies and government on the other hand.

In recent times, mining operators especially the small scale miners violate the rights of the people in the communities leading to deprivation of access to clean water from rivers and streams, and rights to farmland for cultivation of both food and cash crops. There were also series of misunderstanding between large-scale and small-scale mining operators of concessions.

4.3 Recommendations

This dissertation has carried out a thorough and candid assessment of the effects of the small scale mining activities on the environmental security for human survival using the Tarkwa-
Nsuaem Municipal as a case study. Based on the findings and conclusions of this dissertation, the following recommendations were made:

- Government and its agencies should encourage the illegal small scale operators to formalize their operations in order to be accessible for supervision, coordination and monitoring. The registered and legal large and small scale mining operators should great employment avenues for the local people through training in order to mainstream them since most of the illegal and smaller operators (galaseyers) were believed to be natives and members of the mining communities who usually go into illegal practices for livelihood and this group see their illegal activities as their right to the land.

- The issuance of licenses and permit for surface/open cast mining should be reduced and most of these companies should be encouraged to explore the underground mining method with appropriate techniques and skills to meet international best practices. This could solve two problems: first the issue of competition and conflict between miners and farmers over arable land will be minimized, and secondly, because the underground mining is labour intensive most of the subsistent illegal miners could be employed into this field to reduce the impact of illegal mining on the surface.

- There is also the need to advocate for the minimization of the use of mercury by the small scale miners to avoid contamination of water bodies in order to reduce mercury poisoning and other mining related diseases.
The Government together with the Tarkwa-Nsuaem Municipal must be able to require the mining operators to abide and ensure proper and comprehensive environmental protection measures to avoid chemical spills and require quicker and effective action after chemical spills have occurred. The Government should establish an independent and effective oversight mechanism to monitor small scale mining companies to fully comply with national and international health and environmental protection standards.

It is also recommended that the Environmental Protection Agency (EPA) and the Tarkwa-Nsuaem Municipal Assembly should streamline their environmental policy and bye-laws to ensure that the environmental effects of small scale mining activities in the area are minimized to a level that could be contained to ensure environmental security of the area. The two government bodies should try to enforce on the small scale miners to apply and release toxic chemicals such as mercury and cyanide in their operations provided the amounts fall within EPA specifications without actually considering the adverse environmental and health effects on the people.

The government and the Tarkwa-Nsuaem Municipal Assembly should the laws and by-laws on the mining activities in the municipality in order to allow most part of the forest and vegetation to be reserved for agricultural purposes especially for both food and cash crop cultivation since over 60 percent 0f the people rely on agriculture for livelihood.

For the agricultural areas which have been affected and destroyed already, a proper compensation is required for the farmers and the landowners using the correct valuation...
guidelines set up by the government during calculation of compensations for farms and
their produce and this must cover compensation for redundancy of the farmers. Besides,
Farmers in the municipality should not be forced to sell off their farmlands for mining
activities. They should be allowed to take part in decision making and to make them
agree to the terms wilfully. It is also recommended that, there should also be stern and
serious attempts to restore the deforested and degraded lands including covering and
refilling pits and trenches developed during excavation and extraction processes of the
small scale miners in the communities of the Municipality.

- Social conflict resolution in the municipality should be prioritized and this must be
  supported by a proactive approach to avoid situations of conflict through confrontations.
There should be a proper line and chain for making complaints and expressing concerns in
the communities and communities’ concerns must be identified and acted upon prior to
the complaints. Proper valuation of land, property, farms of affected local people in
Tarkwa and its environs is required as part of the compensation.
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