

**FACTORS AFFECTING THE SAFETY COMPLIANCE OF MINING PROJECTS  
IN THE MINING INDUSTRY OF GHANA.**

**A CASE STUDY OF ASANKO GOLD MINE.**

**KNUST**

**BY**

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## ABSTRACT

Health and safety are known as the important aspect relating to employment responsibilities at every field of work, especially in the mining and construction industry. The main aim of the study is to explore the factors affecting health and safety compliance of mining projects in the mining industry. In attaining the main aim of the study, the following objectives were noted, this includes; to examine the level of health and safety compliance of mining projects in the mining industry of Ghana, and to identify factors affecting health and safety compliance of mining projects in the mining industry. The quantitative research method was used for this study and data was gathered by the use of questionnaires. The sampling technique used was the purposive sampling technique, which helped in selecting the respondents who were the staff of Asanko Gold Mine in the Ashanti region. The research used a sample size of 70 where by questionnaires were administered to respondents according to this number, after this process a data results of 52 was returned, the researcher used this results in analyzing the study. Analysis of the data was conducted using the Relative Importance Index and the Mean score ranking. The first objective was attained where by some factors were ranked high as the level of health and safety compliance of mining projects in the mining industry, and this includes: there is a reality of occupational health and safety policy in your company, records for accident occurrences are well kept, accidents are reported to the proper agencies, and lastly, records of accidents are well managed and used in educating others. Factors under the last objective includes: Low level of knowledge on health and safety, Inappropriate training of workers, Insufficient protective equipment being provided, Bad management of safety meetings on site, Unsafe attitudes of workers and lastly, health and safety regulations being inaccessible, in which were the *factors affecting health and safety compliance of mining projects in the mining industry*. The various objectives helped in bringing into light the key factors affecting the safety compliance of mining projects in the mining industry of Ghana.

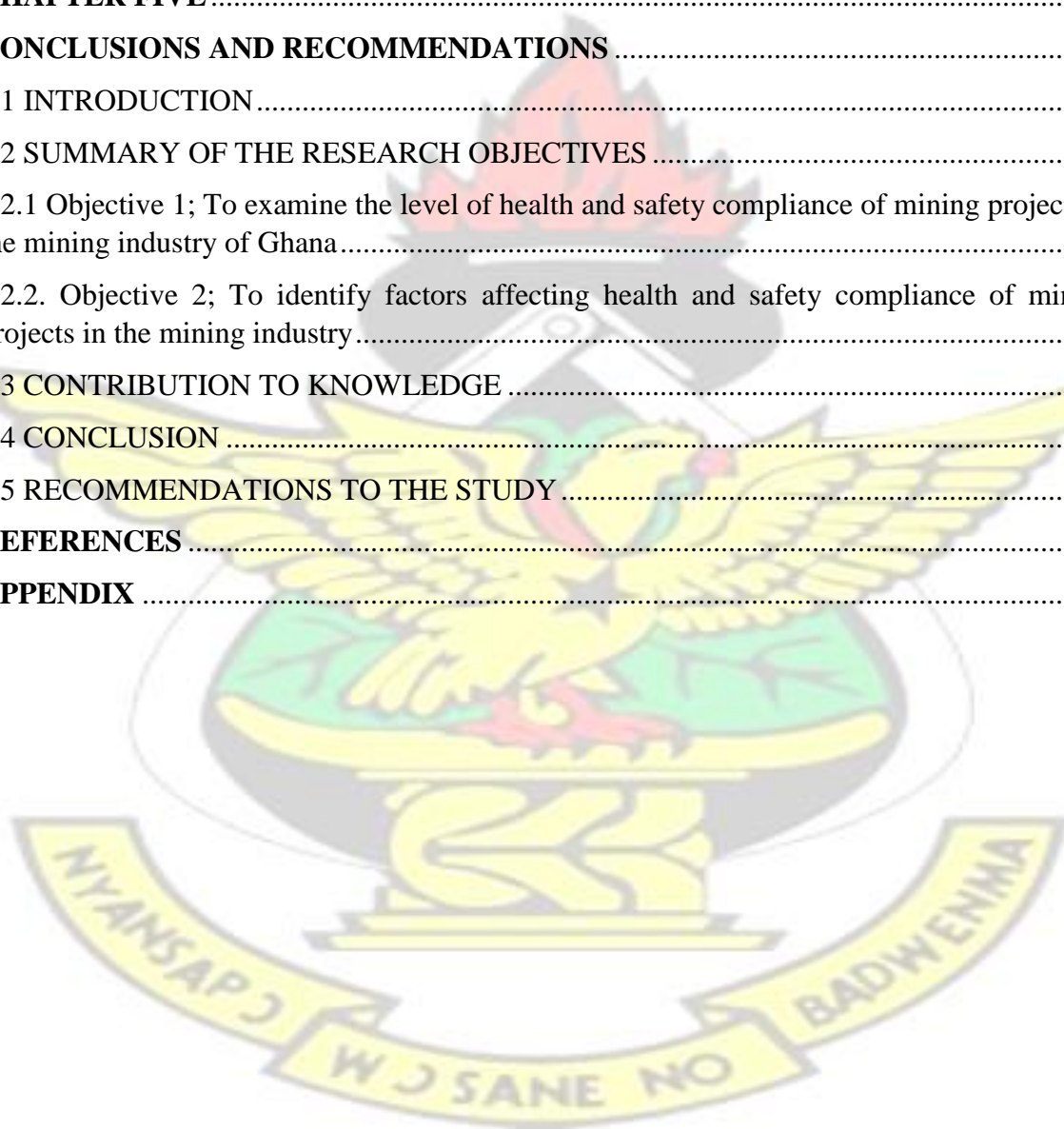
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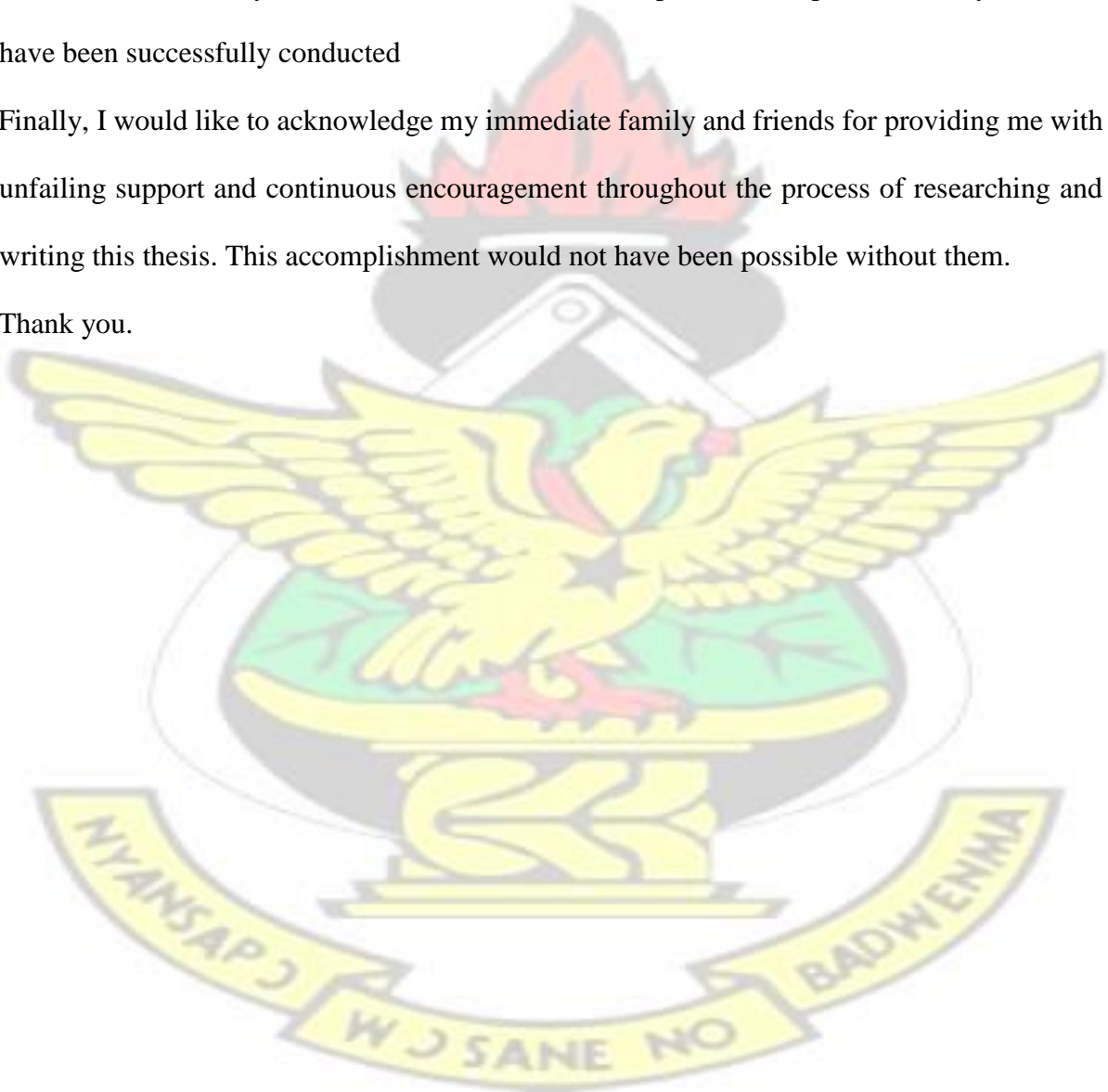


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## DEDICATION

This research is dedicated to my lovely family and the workers of Asanko Gold

# KNUST



## CHAPTER ONE

### INTRODUCTION

#### 1.1 BACKGROUND OF THE STUDY

Health and safety are known as the important aspect relating to employment responsibilities at every field of work, especially in the mining and construction industry (Hughes and Ferret, 2008). A great importance has been specified to harmless and helpful environment of workplace in this recent times (Cole, 2002), this is for the reason that, specialists in labor mostly states that occupational health and safety dealings are required for an increase in production in many industries. Safety and Health is a helpful activity on site that deals basically with protective measures and encouraging health, safety and welfare of persons involved in projects and other forms of the working activities. The aim of all health and safety activities in projects, is to bring about an atmosphere of work that is safe, and ensure that there is effective compliance to it (Whitner, 2001), an example of work environments includes: the mining industry.

It was sated by Hughes et al., that, safety also includes the work environment during a project, and it also considers all determinants that influence health, safety, and the comfort of all workers together with the management of the project or work. Health and safety also comprises of the unsafe working environment situations, hazards, the abuse of alcohol and drugs, and violence at workplace. In place of a minor influence, Whitner (2001) made it clear that health and safety also safeguard managers, suppliers, close by communities, and some other persons who are close by the surroundings of the work place. Whitner, recognized hazards in safety as include other parts of project surroundings that have the possibility to cause violent harm to a worker or any other person at workplace; examples of these are, injury

leading to not hearing, eyesight or body parts damaged, bruises, broken bones, electric shock and burns. Osuala (2005), specified that making safety available to the employees at the workplace needs to be taken serious. Although it is a legal obligation and raises financial compensation in situation where there is failure, nonetheless it can't bring back the life of a person when is not well implemented.

A study conducted by Grace (2014) on the effectiveness of health and safety practices at Anglo Gold Ashanti company. The research used an approach whereby it distributed questionnaires to respondents in gathering data. However, the study had more than 50 percent of its respondents to agreed strongly that inadequate management commitment, the refusal of employees to report minor injuries and the involvement of cost in employee training on health and safety as key problems. Her study also concluded by recommending that adequate protective clothes should be provided, a monitoring team should also be available to check if all workers put on their protective clothes and other given materials. DeJoy, et al. (2000) went further by stating some of the factors affecting safety on our various job sites, and these includes; safety officers that are unskilled to handle issues on site or companies relating to safety, this has led to the misery of accidents in so doing bring about harmful outcomes, fatalities and damages at the industries. There is also inadequate routine, lack of fixed and experienced courses to train workers on safety and health, in helping workers accept the necessity for the compliance of safety at work place. Based on this, it is noticed that compliance of safety and health management must be observe to at all periods by which failure from management may result in a catastrophic consequence. Regrettably, in lots of safety cases, the standards of safety are mostly not taken serious. Lack of training on compliance to safety procedures also obstructs it effectiveness at the industries. However, safety and health

in the organization have to be the concern of everybody, and compliance to safety measure must be taken very serious. Based on this, the study delved deeper into the factors affecting the safety compliance of mining projects in the mining industry of Ghana.

## **1.2 PROBLEM STATEMENT**

Attention to activities and issues of Health and safety is an obligation of everyone at work but most importantly to those in the construction and mining industry where the rate of accident relatively high (Davies and Tomasin, 2002). Non-compliance of occupational health and safety principles have several effects on mining projects in the mining industry of Ghana. Some of these effects comprises injuries, as well as loss of lives, and particularly when it affects a skilled worker, it may cause unnecessary delay leading to extension of work being completed (Maxwell, 2014). Nonetheless, the significance of safety activities in companies, particularly in mining firms has created lots of discussions in recent time (Shipto et al, 2005; Robert and Jackson, 2004).

A Fourth Quarter Police Reports in 2012 shows that, information about injuries at work environments shows that, in two working days all through Ghana, a person may die or get injured at work place, which is caused by industrial accidents and also non-compliance to safety measures at workplace. Lots of workers throughout the world, especially those in the mining and construction industries where accidents are common, turn to suffer from disabilities that are permanent or temporary or fatalities due to inadequate measures for accurate safety and health practices, together with the lack of compliance to safety rules.

This occurrence does not only affect workers and management, but also their families feel pain for their loss throughout their lives.

The various issues, including accidents and injuries above shows the importance of safety and health at work place, especially at the mining industry. This has led to other researchers like Genevieve (2015), to search for factors that hinders safety and health compliance at work place. For this reason, the study investigated the factors affecting the safety compliance of mining projects in the mining industry of Ghana.

### **1.3 AIM OF THE STUDY**

The main aim of the study was to explore the factors affecting health and safety compliance of mining projects in the mining industry.

### **1.4 RESEARCH OBJECTIVES**

The deliberated research objectives are:

1. To examine the level of health and safety compliance of mining projects in the mining industry of Ghana.
2. To identify factors affecting health and safety compliance of mining projects in the mining industry.

### **1.5 RESEARCH QUESTIONS**

1. What is the level of compliance in the health and safety of mining projects in the mining industry of Ghana?
2. What are the factors affecting health and safety compliance of mining projects in the mining industry?

## **1.6 SCOPE OF THE STUDY**

This research focused on the level compliance of safety and health activities in the mining companies of Ghana, which emphasized specifically on Asanko Gold Mine. The research further delved into the factors affecting safety and health compliance of mining projects in the Ghana mining industry. The research did an additional investigation into factors to advance safety compliance in the mining industry.

## **1.7 SIGNIFICANCE OF THE STUDY**

Activities of mining are essential in the economic growth of any country endowed with mineral possessions. This shows that any country having mineral resources like gold, may get involved in mining activities. And it is therefore important to seriously engage safety measures in accordance with these activities.

The study is of much importance because, the results from this study could be used by policy makers of government to ensure better understanding of safety and health compliance in the mining industry. This research also brought out the level of safety compliance of mining projects in the mining industry and will aid professionals in the industry of mining to recognizing the factors affecting the compliance safety in the mining industry. Factors to improve safety and health compliance in mining projects was seen in this research, which added up to knowledge.

This is of a relevant addition to existing knowledge and the body of theory, by the means of assisting to undertake further research in this area of study. Lastly the research delivered an understanding on how practices of safety can be enhanced by several companies but most especially the mining companies. This will support directors and persons that make decisions

to create careful use of safety activities with the ultimate concern in other to decrease preventable accidents and fatalities in the industries and other firms.

## **1.8 RESEARCH METHODOLOGY**

In aiding to attain the main aim of the study, the quantitative method was selected for this study. This is based on questionnaires for the data collection and the method was chosen because of its statistical and mathematical characteristics that it carries. The targeted population for the research was the staff of various mining companies in Ghana, and most importantly the staff of Asanko Gold Mine. These respondents included the workforce in positions of both supervision and management, together with other staff at the junior level of the various mining companies. Data collection for the research was gathered from the targeted population. The questionnaires were prepared based on the factors from the research literature and this was mainly on the objectives and the aim of the study. The source of the literature was from articles, journals, publications, books related to this field etc. Closed ended and open ended questions were used. Analysis of data was possible using the Statistical Package for Social Sciences (SPSS), and Microsoft Excel 2016 and with the help of the software, the Relative Importance Index together with the Mean Score Ranking were used for analysis of the data. Base on this the method, the key aim and objectives of the study were attained.

## **1.9 LIMITATIONS OF THE STUDY**

A number of research studies of like manner faced certain limitations in their studies being conducted. In carrying out this study, the research has it focus on mining firms in Ghana; but due to the difficulty in accessing the respondents, the time frame of the research and financial

constraints, the researcher may not be able to move around all the mining companies in Ghana. Therefore, the researcher limited itself to the staff at Asanko Gold Mine and data were collected from these respondents (staff) to represent mining companies in Ghana.

#### **1.10 STRUCTURE OF THE STUDY**

This study is grouped into five (5) chapters, and it is outlined in this manner. The first chapter of the study was the “General Introduction to the Research” which entails the studies background information and shows the problem statement for the study. It also demonstrates the main aim of the study and the objectives in which the study worked with. The second chapter presents the review of the extant literature appropriate to the research. The second chapter provided literature built on the info retrieved by other noticeable researchers, identifying the gaps in the literature that the research seeks to address and also draw conclusion on the results gotten from the literature. The information gathered for the study was mainly from journal publications, newspaper publications, books and the internet.

Chapter three brings out an in-depth discussion of the methodology adopted for the research. It also outlines the research plan for the study, the sample size, sampling frame, and population for the study were all be discussed in this chapter. The fourth chapter offered a detailed investigation of all the data gathered for the study. Chapter five gave a summary of the findings of the research, which was based on the main aim and information gathered throughout the entire work. Conclusions and recommendations were seen in this chapter.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

Implementing an effective values of safety at work environment helps in increasing productivity, but this must be a consistent culture on site. A good safety culture will certainly help attain desired goal at work place in regard to zero incidents (Roughthen, 2002). The literature review was presented in this chapter, by which the theoretical outline of the study was primarily discussed. Some relevant definitions were defined in this chapter, and this was done in regard to this study. The study further looked into the level at which compliance to safety has been accepted in the mining industry of Ghana. Secondly, it presented the factors hindering health and safety compliance of mining projects in the mining industry and lastly the factors to advance safety compliance of mining projects in the mining industry of Ghana. The various information in the chapter was gathered from research papers, books, journals, web articles, conference proceedings and other sources that are relevant. These information was gathered to attain the main purpose of the research.

#### **2.2 DEFINITION OF MINING**

The exclusion of minerals from the earth's crust in the service of man is termed as mining (Down and Stock, 1977). In the study of Yeboah, (2008), explains mining as the regaining of selective materials and minerals, other than freshly formed organic resources from the earth crust (Yeboah, 2008), he further stated that this process is the removal of appreciated minerals or other materials that are geological from the earth, usually from an ore body, vein, or (coal) seam. The recovery of materials by mining comprises of bauxite, diamonds, limestone, coal,

iron, precious metals, rock salt, lead, nickel, phosphate, molybdenum and uranium. Wider mining sense can also comprise of extraction of natural gas, petroleum, and even water (Yeboah, (2008)

The very well-known mine in the record archaeological is the "Lion Cave" in Swaziland. Accessible literature specifies that essentially, the following are the eight steps to mining procedures, this includes:

- discover ore prospectively.
- Examination to bringing out the importance of ore where it was situated.
- Resources estimate should be conducted mathematically and estimate the degree and the level of the deposit.
- Plan to appraise the economically recoverable portion of the deposit.
- Ensure a feasibility study to appraise an entire project and make a choice as whether to advance from a projected mine project. This comprises structure to grave analysis of the possible mine, from the early excavation all the way through to recovery.
- Extraction of ore on a huge scale, Yeboah, (2008).

Methods of mining are of four types basically. Primarily, materials may be excavated from surface mines, quarries, open pits, or other diggings open to the atmosphere. This group brings about by far the greatest quantity of mines in the world. Furthermore, there are mines that are done underground, by entering through tunnels. Thirdly, there is minerals and fuels recovery in the procedure of boreholes. Lastly, there is mining through underwater, which has been spread out to the probable mining of the deep oceans Yeboah, (2008)

### 2.3 THE HISTORY OF OCCUPATIONAL HEALTH AND SAFETY

Studies in regard to safety has been in practice for quite a long time since the execution of works have been in practice for some time now. An example is what Elizabeth (2012), stated in the damaging effects of a workplace which was unhealthy to persons who were slaves. It continued in this study that, they were instructed to ensure the safety of the workers, in other words the slaves. From this story comes out history of the procedures to aid the improvement of safety at workplace. In the middle ages, wrote numerous books in regard to mining, by explaining more than a few advanced methods for ensuring ventilations that are good for employees in the mining sector (Raouf & Dhillon, 1994). In the case of Ramazzini, which was in, Elizabeth (2012) mentioned this researcher as a great predecessor of occupational safety in mining, also supported this. It was also written that, the first document in regard to harmful impacts of work situations on the health of workers“ and deliberated the injuries and the extent of fatalities of lots of diverse works.

Being grateful of the social significance of the improvement and economic development of these professions, a discussion was done by Ramazziniin which he suggested several strategies that are protective for decreasing injuries and other illness at workplace (Pease, 1985; Raouf & Dhillon, 1994; Tayyari & Smith, 1997). Even though the initial safety engineers did not really make any serious effort to implement approaches at workplace to check out issues of safety, but instead they placed some basis for present strategies to decrease workplace injuries and fatalities. Workers were replaceable and also many, in which they were see as just people who must work and work well without complaining (Leigh, 1998). Even though in this history times work being executed at workplace were awful, with several workers being children and women who worked in a day for 12-hours, by which they get

vulnerable to diseases, and death for occupation and a process for putting something on the table for their families. Even if a worker was ill or injured, they would hardly report these issues to authorities, because falling sick frequently leads to the worker being dismissed. And all this led to ineffectiveness of safety rules at workplace, and through this there has been a need for safety compliance after many of injuries and fatalities at workplace (Heinrich, 1959; Weindling, 1985).

## **2.4 HEALTH AND SAFETY IN GHANA**

The Ghana Labour Act 2003 demands from employees in Ghana to guarantee their workers are not prone to certain situations that may make them susceptible to injuries. Workers must also do their duties well and see to it that their duties reach the standards of their employees, especially in the area of safety requirement. There are different agencies in countries which is under jurisdictions that are different, by which supervises different industries for employee's safety and workplace safety, nevertheless, in Ghana there is no group or policies that manages safety guidelines in Ghana. A Road safety commission is available but their standards, influence and rules are very limited, on pedestrian and transport industries safety. Mining Regulations 1970 are present in the minerals commission, in which these minerals commission also includes some rules and strategies in Occupational Safety and Health, which only belongs to the industry of mining.

Several fatalities, injuries, and damages of properties is seen in several workplaces but due to wrong classifications, or unfamiliarity with the present procedures, persons do not usually recognize the proceedings and also their real values and ensure operative solutions to them (Annan,2010).

Currently, we have two key statutes that have put in place regulations in the providing of safety services, management and practices in the countries. These comprises of the offices, factories and Shops Act 1970, Act 328 and the Mining Rules 1970 LI 665, by which the following has only been able to manage the mining and the labor areas, in which is very limited in regard to scope, and also provided the delivery which is multisided of developed procedures that are present in the country Ghana. The Workmen's compensation law 1987 (PNDC 187) is present, which is in regard to managing hurts triggered by workplace accidents therefore, has a serious influence on monitoring the safety of a worker.

Organizations with exposure to radiation hazards is been monitored for compliance by the Radiation Protection Board of the Ghana Atomic Energy Commission, nonetheless, because of resources restricted, they compromised the effectiveness of its activities (Annan, 2010). There are some laws which some way somehow influences Safety and Health and these comprise the Ghana Health Service and Teaching Hospital Act 526, 1999, the Environmental Protection Agency Act 490 1994, and the Act 567, 1999 in National Road Safety Commission

Also, it doesn't specify clearly what one must consider as injuries at workplace. It also, doesn't bring out who to be accountable for guaranteeing the activities in Ghana, and applying helpful strategies as per approvals. Presently, the occurrence of accidents on sites are known for being reported to the Department of Factory Inspectorate (DFI) but several firms scarcely report such happenings to the right sources for investigation and solutions towards improving the report by stopping it from happening. When the reporting of these accidents are being made, it takes a while before certain measures are taken towards preventing it from happening, therefore, it leads to no effect or just a little action from the Department of Factory Inspectorate (DFI) towards the firms, especially when they are not being reported at the right time. The

country has seen a level of “Safety and Health exercise infection” among several Ghanaian firms due to the invasion of some international firms who have entered the country, given their shared prospects with precise necessities in the practices of Safety and Health. This shoots an expectation for requirements from contractors, and subcontractors, in which some are Ghanaian, to go by the standards of Health and Safety rules.

## **2.5 HEALTH AND SAFETY REGULATIONS**

Building work involves the design of industrial, residential and commercial property, these undertakings require training to comply with regulations of health and safety, taking into account mining and construction worker’s safety, which also includes the public in general.

The Factories, Offices and Shops Act 1970, Act 328; Act 1987 (PNDC 187); Workmen's Compensation Law, Code of Practice on Health and Safety in Construction Sites (ILO 1992); National Labor Act 2003, Act 651; Regulations of Building and Mining 1970, LI 665 (Fenson, 2007). Cole (2002), noticed that the statutory regulations stipulated most of the health and safety rules and guidelines. The main concern of these Regulations and Acts is to guarantee that companies are conscientiously protecting their workers to fulfill the necessities set out in the Health and Safety Regulations.

### **2.5.1 Section 118 of National Labour Act 651 - General Health and Safety Conditions**

The National Labor Act 651, (Act 2003) provides for the manager to offer workers with safe, healthy and working conditions that are satisfactory. This stipulates that it is the responsibility of the employers to maintain a safe workplace and to guarantee efficient facilities at workplace. The Act initiates that, during the course of their jobs, the employer must make

available suitable equipment, protective clothing and tools for workers to use personally, which should not be an additional cost to the employees. It is the employer's duty to give employees the essential training, instructions, and supervision. The employer must also make ready facilities that are good, adequate accommodation, laundry, bathing and other storage amenities available to the workers on site. At the construction site, the contractor should also make available good supply of drinking water, (Act, 2003).

### **2.5.2 Factories, Offices and Shop Act 328, Act 1970**

The Factories, Offices and Shop Act 328 addresses issues related to the construction industry's health, safety and welfare. These clauses are listed below:

#### **2.5.2.1 Rule one - Compliance**

It is stated by the rule that every employer must fulfill the requirements of health, safety and welfare in the course workplace construction (Ghana Legal, 2015).

#### **2.5.2.2 Rule two - Provision for Welfare Facilities**

The Act requires employers to provide sufficient facilities for healthcare, including lodging and canteen facilities. Facilities in the canteen must be fitted with tables and meal chairs (Ghana Legal, 2015).

#### **2.5.2.3 Rule three - Provision for First-Aid**

The rule stated that at the job site, employers should provide for first aid facilities. During the course of the job, these facilities should be functional and adequately built with good equipment to make available adequate health care and treatment to workers injured in

accidents events. Managers are liable for insuring their jobs and workers against fatalities and injuries (Ghana Law, 2015).

### **2.5.3 Workmen's Compensation Law, Act 1987 (PNDC 187)**

In depth, the PNDC 187 enshrines means to reimburse employees who are injured or disabled as a result of incidents at the workplace. It increases the security of the workplace for workers and promotes a working environment which is healthy (Ghana Legal, 2015).

## **2.6 SAFETY AND ITS IMPLEMENTATION**

Zohar and Gil (2004), theorized that supervisory influence on safety practices has a direct relationship with the level of worksite safety climate. Mohamed (2002), also added that there is relationship between construction safety climate and the work safety behaviour in the construction work environment. However, Glendon and Debbie (2001), instigated that construction workers do not perceive a direct relationship between site safety climate and performance of construction safety. Dedobbeleer and Pearl (1987), also added to the argument that there is no relationship between the knowledge of construction workers on performance of safety and interventions of safety.

Lin and Mills (2001), instigated that the implementation of health and safety in various occupations is a major challenge due to fear of being prosecuted when one fails to meet the standards required for construction health and safety. It was further added that health and safety practices becomes a major burden especially to small firms where their financial strength is low. Helander (1991), added that hazards of safety are specific to the type of job being classified and also due to the fact that most construction workers underrate the risks

associated with their work. It was identified by Abdelhamid and John (2000), the very factors of accidents and this includes: Not being able to identified working conditions that are not safe, working in a condition where hazard has been identified and also worker not safe guarding him or herself even though working conditions are also not safe.

## **2.7 THE CAUSES OF SAFETY HAZARDS IN MINING INDUSTRY**

Literature relating to safety shows that, there are a number of causes of safety hazards in the mining industry that are quiet peculiar. Ochsner and Greenberg (1998), identified the causes:

### **2.7.1 Physical Hazards**

This type of hazard entails, injuries that are painful remains a very essential issue, in which ranges from a normal issue to the level of fatality (DeJoy, 2000). He further stated that common causes of injuries that are fatal include fires, falls from height, explosions, mobile equipment accidents. According to Nachimas and Nachimas (2009), applying risk management has added an important decline in the several occurrence of injuries in developed countries, as compared to poor countries in which experiences lots of accidents. They brought out their ideas that, there must be a vivid improvement, seen to the accepted level of a broader community. A study conducted by Osuala (2003), in regard to the mining industry, on the strategies to manage physical hazards, made it clear that risk management and effective safety procedures can help manage physical hazards. Noise in the mining industry has turned to become a norm, in which these things takes place through blasting, drilling, handling of heavy materials, cutting, processing ore and crushing. Strategies to handle these noise has turned to become an issue which is quiet difficult to handle, in which causes a lot of harm to the human

body. Heat and its issues have been a serious problem in mining industries. Mining gold underground brings heat exhaustion which is an issue in mining (Nachimas and Nachimas, 2009). In the study of Harvey et al (2001) mentioned that workers experience vibrations on their body's during the execution of work when, mobile equipment's like scrapers, diggers, and many more. These vibrations can cause disorders on the human body, which can lead several issues like financial loss.

### **2.7.2 Chemical Hazards**

Some chemicals like the crystalline silica, has countless times been a very severe hazard in the mining industry (Guzzo and Dickson, 2000). In mining areas silicosis has been a focus to significant investigation due to its hazardous properties (Haddel and Ojikutu, 2005). In advanced countries, axial water, fed rock drills, wet methods; ventilation, bounded cabins and protecting of lung have mostly helped in controlling silicosis. Exposing crystalline silica for a long time can lead to chronic lungs disruptive disease (Gilmer and Haller, 2004). One other serious hazard in the mining industry is coal dust, which has led workers in this sector's pneumoconiosis' and other chronic lung diseases (Ingalls, 2001). In developing countries, these risk have been controlled greatly though ventilation, dust suppression, and protection of respiratory (Gilmer and Haller, 2004). Throughout all this, one of the effective procedures of maintaining control is through vigilance. And this must be undertaken to ensure good control measures, nonetheless, needed to preserve control systems that are effective.

### **2.7.3 Biological Hazards**

Hale and Hale (2005) mentioned that in mining areas, most diseases that are biological are well known in countries that are developing. Example is, the risk of diseases that are tropical such as malaria and dengue fever at some mining remote locations. It said by Haddel and Ojikutu (2005) mentioned that Leptospirosis and ankylostomiasis were known as common in the mining sector, but the prevention of rats and the enhancement of the environment has well-ordered these hazards efficiently in the world today. In managing this, Haddel and Ojikutu recommended that consistent microbiological analysis of the water is essential to discover Legionella contamination other microorganisms.

### **2.7.4 Ergonomic hazards**

Huselid (2006) recommended that even mechanization in the mining industry has been increased, there is still a level of manual management. Trauma conditions goes on to be the highest of workplace diseases in the mining industry and this extends to a severe disability. Activities in mining are mostly executed in 24 hours a day and 7 days a week, by this, the mining industry ends up going by shift work, in which some workers come at some point, then others come at another point. And this has caused a tendency of 12 hours move in the ages. Eninger (2006), noted that weakness relative to shiftwork has been known as a case to investigate which is significant in the mining industry. He stated that a lack of sleep, which might be expected in hot locations, have been shown to cause impairments of cognitive and motor performance among drivers from other industries.

### **2.7.5 Psychosocial Hazards**

Flippo in (2003) conducted a study on „mining and alcoholism“ and it was made clear that have alcohol and drug abuse has been a serious situation in the mining sector, but strategies and certain effective procedures have been done in most of the mining industry that deals in large operations. Eninger (2006) suggested that, operations in mining generally entails the capacity of blood alcohol and urinary drug metabolites on pre-employment and following accidents. Several mining companies are mostly situated in locations that are remote. Nevertheless, firms tend to locate in places that do not have permanent places for establishing, (Eninger, 2006). Inappropriately, fatal and shocking injuries goes to happen in mining and normally have a thoughtful influence on self-confidence. Post-traumatic stress disorders from time to time progress in witness, coworkers and directors.

### **2.8 LEVEL OF NON COMPLIANCE**

Noncompliance of safety regulations level can be attributed to employee and management attitude among some factors towards the works at hand (Haupt and Smallwood, 1999), therefore level of compliance expected in safety includes; Records for accident occurrences must be kept well and accidents being reported to the proper agencies, and many more. In the enterprise department, Trade and Employment (2011) several things add up fatal occurrences on the grounds of mining which can be credited to the lack of suitable worker training and inadequacy to deliver and implement the use of safety tools. However, Laney (1994) as cited by Othman (2012) argues that noncompliance can be credited to inexperience managerial attitudes on sites. As indicated by Bureau of labour statistics (2013)

A preliminary total of 4,383 fatal construction work injuries were recorded in the United States in 2012, The UK constructions news (2006) indicates that several thousands of dollars are given by the companies of construction to persons that encounters accidents on sites due non-compliance to safety principles, others also ensure to keep record for accident occurrences, reported to the right management, ensures regular evaluation and monitoring of work safety performance, ensures that protective equipment are well provided and many more that can be offered. Haggins (2009) explains that delay in time on projects can also be recognized as non-compliance, likewise lead to budget being increased (Sidumedi, 2009).

## **2.9 FACTORS AFFECTING HEALTH AND SAFETY COMPLIANCE OF MINING PROJECTS.**

There are several factors that affects compliance to safety measures on job site. It was said by Malhorta (2004) in support of the fact that, lack of teamwork; amongst employees leads to accidents in the industry. Also, the incapability of organization to implement adequately their pronouncement to workers to comply to safety standards at mining sites has affected several issues during the execution of work. Nonetheless, management who have the authority to implement health and safety schemes, also ends up implementing a general safety program in all industries, in which they do not take into consideration to check how effective this is, and this ends up affecting workplace in regard to hazards. In this same area, Mansfield (2001) figured out that, several organizations have embarked on safety practices without putting in any form of procedures in holding it effectively, and this has affected compliance levels, and has led to noncompliance of safety measures. Most firm lack an innovative and successful human resource management policy, values, and procedures, by which has caused human

resource to be practiced anyhow. Certain issues associated with compliance was identified by Kartam et al. (2000), and these issues included; health and safety regulations being inaccessible, inadequate record keeping for accident occurrences, workforce being disorganized, issues regarding safety are not respected, widespread exploitation of subcontractors and the reduced size of mining and construction firms. Teo et al. (2005), identified factors that influence safety compliance in mining industries, and this includes; poor safety practices, unsafe attitudes of construction workers, poor management of commitment, low level of knowledge on health and safety and inappropriate training of workers. Tam et al. (2004), made it clear that, factors affecting the management of safety included; insufficient protective equipment being provided, bad management of safety meetings on site, poor safety training, no recognition given to health and safety, low zeal from stakeholders to put in effort for health and safety in mining industries to stand.

Ingalls, (2001) proved in his work on the procedures and performances of safety that, providing safety materials and measures on site are quite expensive, in which leads to leaving employees at work place to leave anyhow which makes them susceptible to hazards on site. DeJoy, et al. (2000) inscribed that unskillful safety officers hired to take care of health and safety matters in many firms has been the nuisance of industrial accidents thereby triggering unnecessary industrial damages and fatalities. There is an environment of inadequate routine, consistent and experienced training courses on safety organization for workforces to grow the need for health and safety protections. Lastly, there is inadequate control programme from government to visit organizations mainly the mining firms to find out if these firms go by the rules of safety in their firms, and these challenges affects the compliance to safety measures.

Other researchers also considered this area of research, whereby they considered the factors affecting safety compliance of mining projects, and some of these are:

### **2.9.1 Cost of compliance**

Safety and its compliance, said by Smallwood (2004) is a substance for improved performance in relation to cost. Management are presently eager to use money on compliance, because in the past years, compliance to safety (accidents and its cost) are quiet high. Windapo (2011), stated that, it is not astounding that most organization observe regulations as another burden, which they also have to comply by together with the costs it brings, as said by Geller (2000) says compliance with the occupational safety and health rules as high cost. In a way of avoiding all these costs additions, contractors choose not to comply fully to safety rules given. Smallwood (2004) appraised that the H&S systems implementation within an organization is between 0.5% to 3% of total project costs. It was further said by Baxendale & Owain (2000) that the costs of carrying out H & S schemes on construction and mining companies that are small are high as compared to that of larger projects.

### **2.9.2 Knowledge and Training**

In the year 1999, Haupt and Smallwood found out that, the lack of ineffective training is a main source of workers not complying safety regulations at workplace. Employees that are not well trained and skillful will not have enough knowledgeable to comply properly to simple rules on safety (Smallwood, 2002); in which will lead to under estimation of hazards that may occur when these rules are not obeyed (Haupt and Smallwood, 1999; McLeod, 2007). It was noted by Smallwood (2002) the extensiveness of the lack of understanding by employees

when it comes to H & S regulations and its understanding, Haupt and Smallwood (1999) recognized that a few employees are actually conscious of the safety and health requirements in the industries. Smallwood (2002) is of the view that directors are improbable to be dedicated to health and safety legislature if their level of awareness of H&S directing requirement is limited together with a lack of adequate training.

### **2.9.3 Compliance with health & safety regulations**

Information is being picked up through perception to have impact on behavior (Bridgeman and Hoover, 2008), and it is exceptional to persons (McDonald, 2012). Thus, diverse persons will have diverse opinions of a given circumstances. Mcleod (2007) finds out that there are a number of elements that have an impact on perception, and those determinants are made up of opportunities, feeling, perceptions and motivation (Mcleod, 2007). A well normal belief is that, lots of accidents are not as a results of the carelessness of employees, but by failures in management, which is the main obligation of management in all mining and construction sectors (Baxendale and Owain 2000).

### **2.10 Effects of non-compliance of occupational health and safety**

According to Hughes & Ferrett (2005) industries like the construction and mining are very accident-prone industry. Odeyinka et al., (2005) believe that workers in these industries are more likely to be killed than any other workers, as explained by Maloney (2012), noncompliance of safety have several effects which comprises of accidents such as objects falling, falling from heights, cutting off of limbs due to mismanagement of tools that are heavy. Construction works suffer a lot from accidents depending on the severity of the injury

however some workers may require light or restricted duties. Others are forced to miss multiple days of work to recover, resulting in lost wages (Ransasky,2013) Aside the accidents Haggins (2009) makes it clear that not complying to safety rules will certainly lead to extra cost of works originating from finance given as compensations to persons that are affected. In all, the following can be described as the various effects due to noncompliance of occupational health and safety, and these are

- Accidents occurring as a consequence of noncompliance.
- The cost of construction works being increased.
- Elapsed time.

### **2.10.1 Common accidents as a result of non-compliance**

In industries, owners, architects, and contractors have the responsibility to ensure a good environment for work, and their carelessness on rule for safety may lead to several injuries at work place (Laufer, 1987). According to Disparti Law group (2012) Noncompliance with occupational health and safety causes a lot of accidents thus resulting in serious injuries and death, Sa (2011) classifies accidents into the following categories namely falling hazards, caught in and struck by hazards and electrical injuries on the other hand.

#### **2.10.1.1 Falling Hazards**

According to United States of America labour Department (2009) falls can be grouped into five (5) main types namely; falls from scaffolds, building structures, exterior construction areas, stairs and ladders. Fall is described by (Bernard, 2009) as a common injury that occurs when a worker near an open-sided floor focusing on his work, steps backwards or to the side without looking and ends up falling.

### **2.10.1.2 Collapsed Excavation Walls and Trenches**

Eschenasy (2008) describes trench collapses as the situation where a trench cave-ins and side wall collapses on workers.

### **2.10.1.3 Electrical Accidents**

These accidents are frequently caused by not using appropriate eye and ear protection. Nail gun injuries have increased each year making eye injuries quite common (Bernard 2009). Also as indicated by Maloney (2008) Live wires and dangling electrical wires can cause electrocution that can easily kill workers. Electric shock occurs when the body comes into contact with electric current.

### **2.10.1.4 Vehicle accidents**

Equipment in construction that are large: example is, forklifts, cranes, road graders, dump trucks and concrete mixtures, etc., may be harmful on sites because of its size and weight, the drivers and workers become potential dangers on a construction site due to their weight and size, this can lead to accidents that are can lead to death on the lives of drivers and workers (Laufer, 1987).

## **2.11 ADVANCING HEALTH AND SAFETY COMPLIANCE OF MINING PROJECTS IN THE MINING INDUSTRY OF GHANA.**

Management which is effective must be active to bring in good performance of safety and work compliance on site. It is well-known that onsite safety and health organization is vital in classifying hazards that are key, connecting site work (Fang et al., 2004). A performance

which stands on procedure to management of safety has been endorsed by numerous scholars and also been established to advance efficiently the practice and compliance to the industry kind of safety activities (Lingard and Rowlinson, 1998). Toole (2002), its projected that there would be Correct tasks of errands to leaders in other sectors to advance the compliance of safety. Hinze and Raymond (2003), postulated that a study should be directed on the awareness of management and workers in regard to safety projects.

Ground-breaking practices are desirable for the advancement of compliance to safety and health at jobsite, (Sorensen et al., 2007). Cascio (2001), mentioned that organization must express a policy of safety and to keep its implementation being effective in the industry. He also said that to improve the rule's compliance and sustainability, a health and safety programme must be established, which includes four parts which are: an active system of record for safety, a budget which is tangible, commitment of management to safety, and the upright activities performed by organization. Dedobbeleer and François (1991), recommended that management needs to address the apprehensions of workers when expressing the safety policies of organization. A role should be played by the government in the lawful implementation of safety guidelines in businesses and ought to be part in the commencement of programs in regard to safety compliance, (Tam et al. 2004). Hinze and John (2003), prompted that actions that influence safety performance positively include diminishing or removing worker turnover and improved development in company size. Hare et al. (2006), hypothesized that safety should be combined at the stage of preplanning in every work, in the industry of mining. Hinze and Raymond (2003), postulated that inspections of safety project should be led to deliver evidence on the physical situation of the worksite, in a way of ensuring works against injuries at jobsite. Abudayyeh et al. (2006), prompted that the costs of seeing

worksite damages may be eradicated or condensed by dedicated labors of safety compliance at workplace. However, Rulka (2004), juxtaposed that safety is the sole responsibility of workers in each sector, in order to mitigate safety risks and hazards.

Rudin (2005), identified measures to ensure the safety compliance at work;

- Execute full verification of safety performance, processes and programmes against approved standards.
- Develop an effective safety reporting system
- Formulate a package for tracking and analysing jobsite accidents.
- Ensure continual involvement of contractors, management and safety and health practitioners to enhance safety performance.
- Maintain the work environment to approved Health and Safety Standards.

Gambatese et al. (2005), recommended that the safety of workers should be taken into consideration before execution of work. Houtman and Bossche van den (2005), instigated that it is mandatory for employers to provide adequate equipment as protection for workers against noise, especially where the level of noise exceeds 85 decibels. In order to overcome such problems relating to safety, and this will also lead to compliance of safety measures, an implementation of a safety program has been identified as one of the significant methods (Aksorn and Hadikusumo, 2008). According O'Connor et al., (2005), stated that adequate training of health and safety should be provided to workers. A safety performance measure should be frequently employed depending on the standards of the industry by eliminating the rate of incidence of injuries and to improve safety compliance (Hinze and Raymond, 2003).

***Protective Equipment and Clothing and their uses.***

To ensure that employers offer all workforces with personal protective equipment and attire on the construction site during operations of work (ILO, 1992).

The following includes;

- Safety helmets or hard hats to safeguard the head from flying or falling objects and materials, or hitting the head against constructions;
- Clear and coloured goggles, face shield, screen to guard face or eye from Substances that are harmful substances during procedures such as cutting flame, welding, and many more
- Protecting attires such as gloves, gauntlets, and head coverings,
- Aprons, overalls, and close-fitting boiler suits to guard the hands and the entire body against substances that are harmful, and has heat radiation, which can deform skin.
- Tough impervious footwear to guard the feet from nails that are sharp or tools underneath.
- Breathing apparatus and other gadgets to armor workers beside substances that are hazardous such as gases, dust, and fumes (ILO, 1999).

### ***Health and Safety Precautions in Excavation***

Fenson (2007), specified that the following practices should be safeguarded when one undertakes excavation works as providing by General Provisions Regulation 1961.

- a. A good worth of timber or other similarly good material should be fixed to excavation sides
- b. Correct technique of excavation should be engaged
- c. Consistent review and management of excavation task should take place
- d. Excavation work should be performed by workers with skills that are appropriate.

- e. All supports and struts needs to be well protected and durable to hold sides decisively.
- f. Safeguard a good exit for workforces to use in the happening of disaster in the course of excavating.
- g. Scrutinize near-by structures frequently to notice for failing buildings.
- h. Offer fencing where work going on is open to the road side.

## **2.12 BENEFITS OF COMPLIANCE TO OCCUPATIONAL HEALTH AND SAFETY**

Hinze and Raymond (2003), instigated that the occurrence of injuries is a main worry since occurrence of such things are negative. Helander (1991), posited that, in construction and other firms like mining, the cost associated with accidents at job site constitutes over 6% of the costs. These costs should therefore provide some monetary incentives to managers to implement safety policies and also encourage managers to put in funds into good practices of safety and ensure that there is effective compliance to these practices.

Cascio (2001), observed that good safety management will lead to the modification of cost associated with the occurrence of accidents. Such costs include;

- Overtime cost
- Cost of repairing or replacing damaged equipment
- The price to pay for time lost when attending to issues of accidents.
- Charge that comes in compensating injured workers.
- The charge of medication that are unexpected and unbudgeted for by the company

Rudin (2005), identified the benefits of incorporating safety measures in organizations as follows:

- It reduces the existence of accidents and fatalities
- It supports sound working atmosphere;

- Helps to improve employee's morale to work
- Promotes good communication during the execution of work

### **2.12.1 Protective Equipment and Clothing and their uses.**

It is the responsibility of management to make available PPEs and other essential clothing for workers in mining and construction companies (ILO, 1992). These include;

- Helmets to protect the head from falling and flying materials that may fall and also protect workers from hitting their heads to structures that are big.
- Goggles that are clear and coloured to guard the eyes from dangerous objects during the execution of work, such as concrete mixing, welding etc.
- The provision of protective clothing, which includes overalls, aprons, gloves and head coverings etc. This is to protect the entire body against burning and other harmful things that can happen to the body.
- Solid boots or footwear to guard the foot from harmful tools.
- breathing and respiratory devices to protect workers from substances that are hazardous to the body, examples of these are gases and dust etc. (ILO, 1999).

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 INTRODUCTION**

This chapter the methodology of the study and it explains the methods used in gathering, organizing and analysing data. Collection of data was also mentioned in this chapter, in which how data was examined was also mentioned for the purpose of the factors affecting the safety compliance of mining projects in the mining industry of Ghana. In summary, this chapter explained how the population was defined, the sampling technique used, the determining of the sample size, the analytical tool to be used and other appropriate methods to the study was also made known in this chapter. Hence, the chapter is mainly to present the research methodology accepted for this study.

#### **3.2 RESEARCH APPROACH**

In this section of the chapter, it was relevant for the study to presented the approved approach. According to some researchers, a research methodology is the general approach the researcher takes during the execution of the research project Leedy and Ormrod (2001), there are essentially two methods to be well considered in describing the collecting and analyzing of data, namely the qualitative and quantitative approaches; these two approaches have important roles in a research study and any of these two methods used appropriately, brings out good results.

The quantitative approach was employed for this study, because of its statistical and numerical features, which was also adopted by the study. According to Kothari, (2004) and

Dawson, (2002), the quantitative approach involves the generation of statistics or data in a quantitative form by accepting important survey research, using approaches such as questionnaires or structured interviews (Kothari, 2004; Dawson, 2002). The quantitative procedures also have the capability to make good use of group of persons that are small to make inferences about greater group of persons that would be excessively costly to the research. Quantitative approach involves the generation of statistics or data in a quantitative form by accepting important survey research, using approaches such as questionnaires or structured interviews (Kothari, 2004; Dawson, 2002). Primary data will be used for the research. The researcher selected the quantitative approach because the study used structured questionnaires and this was prepared and distributed to the respondents chosen.

Data was gathered from selected respondents in the greater Accra metropolis.

### **3.3 POPULATION DEFINITION**

The chosen respondents for a study are known as the population of the research. In identifying the research approach there also a need to identify the population from which the sample will be taken from (Ritchie et al., 2003). It was said by Bacon-Shone (2015) that a population is the whole elements, objects and events in a particular setting that the researcher intends to investigate to generalise.

The literature above makes it clear that it is essential to have a specific population for a study being conducted, so as to help attain the main aim of the research. The population for the study was mainly limited to the staff of Asanko Gold Mine in the Ashanti region, which entails management staff, the senior members and junior members. Data will be organized and

gathered from the selected respondents from Asanko Gold Mine in representing other mining companies in that metropolis.

### **3.4 SAMPLING PROCEDURE**

Babbie (2007) mentions that sample is a smaller unit or subsets bearing the same characteristics of the population of interest, in which sampling is a process for choosing a quota of the population to characterize the whole population. The two widely used types of sampling technique by most researchers are the probability and non-probability sampling technique. Probability sampling is the fundamentals of the population in which it is recognized as an opportunity of being designated as sample subjects; while in nonprobability sampling, the variables do not have a known chance of being chosen as subjects which fit into the broad groups of suitability and purposive sampling, (Babbie, 2007).

The purposive sampling technique was selected for this study. According to Ritchie et., (2013), purposive sampling method permits the researcher to select persons or a group of people who have good knowledge on the subject being discussed. The study limited itself to mainly the staff of Asanko Gold Mine in the Ashanti region, in place of mining companies in the metropolis. These respondents are directly involved in mining projects and its safety compliance on site. This was made possible due to the selected sampling technique.

### **3.5 SAMPLE SIZE**

According to Passer (2004), a sample frame represents the “operational definition of the population and according to Bryman (2004) explains sampling technique as the process to select a unit or an entity from a sample frame or population that its characteristic will reflect, in helping achieve the main aim of a study.

The staff of Asanko Gold Mine in the Ashanti region was selected as the population for the study, this is because, these respondents are directly involved in mining projects and have a lot of knowledge in this area of study in regard to safety compliance. As stated initially, purposive sampling technique was selected for this study, and (Erbil et al., 2010) purposive sampling method permits the researcher to select persons or a group of people who have good knowledge on the subject being discussed.

To get sample size, the researcher, chose 25 respondents each, from the management staff and the senior members, whereby he also chose 20 respondents from the junior members.

Data was collected from respondents using questionnaire.

### **3.6 DATA COLLECTION**

In conducting a research study, data collection is very key and based on this the study had to approve a tool for data collection. The study decided on a structured questionnaire which was considered for the collection of data from targeted respondents. The staff of Asanko Gold Mine in the Ashanti region were selected as the population for the study, this is because, these respondents are directly involved in mining projects and have a lot of knowledge in this area of study in regard to safety compliance. The questionnaire was distributed to the selected respondents.

In data collection, a questionnaire according to Abdal-Hadi, (2010) is possibly the most broadly used method for conducting most surveys in the research process. A questionnaire is administered to help gain accurate information from respondents to help attain the main aim of the research. In this study the questionnaire prepared comprised of four main portions; Part one, Part two, Part three, and Part four. The first was specifically on the demographic data of

the respondents, examples of these were respondent gender, academic background, their level of education and other questions relevant to the researcher, Part two sought to examine the extent of the level of health and safety compliance of mining projects in the mining industry of Ghana. Part three presented the factors that have been identified as the factors affecting health and safety compliance of mining projects in the mining industry. The last part, which is the part four looked into solving the issue tackled by the study and this was to identify the factors to advance health and safety compliance of mining projects in the mining industry of Ghana. These were presented in the questionnaire to the respondents and a five-point Likert scale was adopted in this study to measure the response of each respondent. Close ended questions were asked in each part of the questionnaire for the respondent to select from a set of given answers and at the end of each part, an open ended question was asked to enable the respondents qualify their responses. The questionnaire was well structured and presented and this was administered to the selected respondents, who also had great knowledge in the area of the study, in support to achieve the key goal of the study.

### **3.7 DATA ANALYSIS**

Data processing involves analyzing the questionnaires, coding and entering them into the computer for analysis. In this study, the data collected were gathered and analyzed using the Mean score ranking and the Relative Important Index, which was selected to aid in analyzing data collected. This tools helps in ranking the factors that were selected, and by the help of these tools, the study analyzed data collected to aid in arriving at a successful conclusion.

### 3.8 CHAPTER SUMMARY

This chapter engrossed on factors affecting the safety compliance of mining projects in the mining industry of Ghana. Quantitative research approach was employed through which respondents selected for the study was the staff of Asanko Gold Mine in the Ashanti region of Ghana, in which comprises the management staff, the senior members and junior members. A sample size of seventy (70) was selected by the help of the sampling technique selected. Based on this the questionnaires were distributed to the targeted respondents. The collected data were analyzed using the Mean score ranking and the Relative Importance Index. The next chapter will go into the analysis of the study.



## CHAPTER FOUR

### DATA ANALYSIS AND DISCUSSION

#### 4.1 INTRODUCTION

This chapter explains on the analysis of the data attained from the field. The chapter is subdivided into four namely demographic data, and the various objectives which entails examining the level of health and safety compliance of mining projects in the mining industry of Ghana and the factors affecting health and safety compliance of mining projects in the mining industry. A total of 70 questionnaires were given to the population targeted and a total of 52 representing 74% were received. Results were presented in tables and charts formats.

The first table below contain a number of questions that respondents were asked which has been merged together, this questions includes, the gender of respondents, the years that respondent have worked in your company, and the number of years\* respondents have worked in his or her present capacity as a staff.

**Table 4.1 Respondent characteristics**

<b>Characteristics</b>	<b>Frequency</b>	<b>Percent</b>
<b>Gender</b>		
Male	38	73.1
Female	14	26.9
<b>Years that respondent have worked in your company</b>		
<b>Less than 2 years</b>	8	15.4
<b>2-5 years</b>	10	19.2
<b>6-10 years</b>	25	48.1
<b>more than 10 years</b>	9	17.3
<b>How long you have worked in your present capacity</b>		

	Frequency	Percent
<b>Less than 3 years</b>	6	11.5
<b>3-5 years</b>	14	26.9
<b>6-10 years</b>	20	38.5
<b>over 7 years</b>	12	23.1
<b>Level of education</b>		
<b>HND / CTC</b>	12	23.1
<b>Degree</b>	26	50.0
<b>Postgraduate</b>	9	17.3
<b>PhD</b>	5	9.6
<b>Total</b>	<b>100</b>	

Source: Field Survey, 2019

From the first part of table 4.1 shows the gender of respondents, the study found it relevant to know the number of males and females at the selected mining sector. Since females normally comply to rules given and males are normally difficult in complying to rules. This was attained based on the influence of respondents. In the table 4.1 below, it is seen that majority of the number of respondents were males having a percentage of 73.1 %, in which the percentage of females there were 26.9%. From these, it is observed that most of the workers present at the mining firm are men and the rest are women, which means compliance to safety measures needs much attention in this sector. This makes the study being conducted very relevant.

The second part of the table presented the number of years that the respondents have worked in their company, just to have an idea of how much information they have about their company and how well they have known the company and its work input. From the table 4.1, a percentage of 15.4% have worked in their company for less than 2 years, also 19.2 % have worked there between two to five years, but majority of the number of respondents has worked in the company between 6 to 10 years, and 17.3 percent have worked in the company for more than ten years. We can come to a conclusion that more than half of the workers in these

mining companies have worked for more than 5 years which shows that most of the respondents have in-depth knowledge in regard to what is ongoing in the mining sector. This makes it clear that most of the respondents answered the questions with much confidence.

This third section of the table 4.1, asked respondents how long they have worked in their present position, this helped the study to have certain information about respondents and how long they have been in their current positions at work place. As to the level of knowledge they have in their capacity at workplace. And from the table 4.1, it is seen that, for less than 3 years 11.5 of the respondents have worked in their present capacity, secondly, between 3 to 5 years 26.9 percent of the respondents have worked in their present positions that they carry at work. And between 6 to 10 years about 38.5 percent have worked with much experience in their present capacity, Lastly, over 7 years and above about 23.1 percent of the respondents have worked in their present positions at their work and this reveals that a greater percentage of the respondents have much experience in their present position that they are in now.

The last section of table 4.1 above shows the educational level of respondents who were sampled for the study. As shown in the table, the results indicate that all the respondents had some level of education, 9 (17.3%) indicated they had master level of education, 26 (50%) indicated undergraduate degree 12 (23.1%) also indicated Higher National Diploma (HND) and the CTC, while 5 (9.6%) had the PhD level of education. The results show that the researchers sampled respondents across the various educational levels and the educational level of the respondents was sufficiently credible with a high level of education and they could have clear knowledge and understanding of the study.

**Table 4.2 The level of health and safety compliance of mining projects in the mining industry of Ghana.**

The first objective which was stated in the questionnaire presented the level of health and safety compliance of mining projects in the mining industry of Ghana. This objective of the study was relevant because, it delved into the level of safety compliance in mining projects. Respondents were giving these factors to help select the level of compliance. The respondents were asked to tick the elements based on the level to which they agree with safety compliance at workplace. And the results of this section was also analyzed using the relative importance index and the results of this made available in the table 4.5 below, as factors are well presented.

<b>No.</b>	<b><i>Level of safety compliance</i></b>	<b><math>\sum W</math></b>	<b><i>Mean</i></b>	<b><i>RII</i></b>	<b><i>Rank</i></b>
L1	There is a reality of occupational health and safety policy in your company	255	4.90	0.980	1 <sup>st</sup>
L2	Records for accident occurrences are well kept	248	4.77	0.954	2 <sup>nd</sup>
L3	Accidents are reported to the right agencies	243	4.67	0.934	3 <sup>rd</sup>
L4	Records of accidents are well managed and used in educating others	210	4.04	0.808	4 <sup>th</sup>
L5	Regular evaluation and monitoring of work safety performance	204	3.94	0.788	5 <sup>th</sup>
L6	Protective equipment are well provided	161	3.10	0.620	6 <sup>th</sup>
L7	Health and safety training programs are well organized	150	2.88	0.576	7 <sup>th</sup>
L8	Full medical coverage provided for workers	121	2.33	0.466	8 <sup>th</sup>
L9	Health and safety regulations are made very understandable	102	1.96	0.392	9 <sup>th</sup>
L10	Health and safety committee is established	55	1.06	0.212	10 <sup>th</sup>

Source: Field Survey, 2019

The first objective of the study was to identify the level of health and safety compliance of mining projects in the mining industry. The study delved into the literature review by gathering information on the extent to which safety compliance of mining project has gotten to. The factors were gathered and presented to respondents to tick by agreeing or disagree with the level to which safety compliance has gotten in their firm. With RII analytical tool the various factors were analyzed. The formulae entails  $RII = \frac{\sum W}{A \times N}$ , W = the weighting given, ranging from 1 to 5, A= the highest weight (i.e. 5 in the study), N = the total number of respondents. Where by the Mean (Mean) was calculated by the SPSS, after results of the data have been coded into the software.

From table 4.5, results gathered from respondents shows that respondents answered questions based on their knowledge and experience from their company. The results were presented in this manner; the first ranked factor was:

***There is a reality of occupational health and safety policy in your company with an RII value 0.980***

Most of the respondents made it known that there was a reality of occupational health and safety policy in their company, and having a policy of health and safety in a company helps in improving safety compliance. This is because most of this polices reveals the importance of safety and how much it helps in improving company productivity and expenditure, because accident occurrence on site leads to increasing cost. Haggins (2009) also mentioned some of these similar to these factors, he stated that budget can be increased based on noncompliance and there is a need to encourage policies in mining firms.

***Secondly, Records for accident occurrences are well kept (0.954)***

This factor was ranked as the second that is well seen as an extent of safety compliance. Respondents ticked that they have seen several accident occurrences being kept well in records. And this is to help find strategies to these occurrences that they may be minimized or not occur again. Keeping accident occurrence record helps to promote safety compliance at work place (Haupt and Smallwood, 1999). And this is a good practice on going at the work place. The fourth factor was also acknowledged in this manner whereby; *Records of accidents are well managed and used in educating others*, and this is to aid improve safety compliance.

***Accidents are reported to the proper agencies 0.934***

Most firms do not report accidents to the right places, therefore accidents occurrence at workplaces and up leading to several difficulties (Haupt and Smallwood, 1999). In this study respondents acknowledged the fact that their company also ensures that accident occurrences are reported to proper agencies like the Occupational health and safety Agency These agencies help in the management of accident occurrences and also ensures that safety compliances at these mining firms are established.

***Regular evaluation and monitoring of work safety performance***

The fifth factor that respondents, also ticked as an extent that safety compliance is known in their company is that, there is regular evaluation and monitoring of work safety performance. Regular evaluation and monitoring of safety performance helps in finding out how well safety performance is in the company, this will aid in identifying the strength and weaknesses in safety. Continuous evaluation and monitoring also aids in bringing out other ideas to ensure safety compliance at workplace, even though this factor was not ranked first, respondents proved the fact that it's been seen in their firm, which encourages safety compliance.

The last two factors that were ranked last were; *health and safety regulations are made very understandable*, and *health and safety committee is established*. The two factors were ranked least as the extent of safety compliance in their company. For this reason, it is observed that even though health and safety regulations are available in the company and being understandable, it hasn't still gotten to the point of it being very effective as expected. It was also noticed that respondents ticked that there is health safety committee but the extent that they selected this factor was very low. From this, it is evident that a safety committee is established in their firm but this safety committee do not function effective as it's supposed to, and with this there is a need that this committee works effective as it's supposed to and also ensure that safety compliance in respondent's firm is well improved.

#### **4.2 FACTORS AFFECTING HEALTH AND SAFETY COMPLIANCE OF MINING PROJECTS IN THE MINING INDUSTRY.**

Based on the study finding the extent to which safety compliance has gotten to, even though safety has gotten to a lot of sites, its compliance still needs a level of promotion to ensure effective promotion of safety compliance. Based on this, the study found it necessary to find out the factors that are affecting health and safety compliance of mining project in the mining industry. The study delves into literature and found out certain factors that affects health and safety compliance. These factors were presented to respondents and after gathering of data, with the help of the Mean score ranking, data was analyzed and results were presented in the table 21 below. The Mean Scores values of each factor were obtained after results of the data are being imputed in a software (SPSS). The software then generates all mean score values that are keyed in the table. All various factors are also analyzed.

**Table 4.3 Factors affecting health and safety compliance of mining projects in the mining industry.**

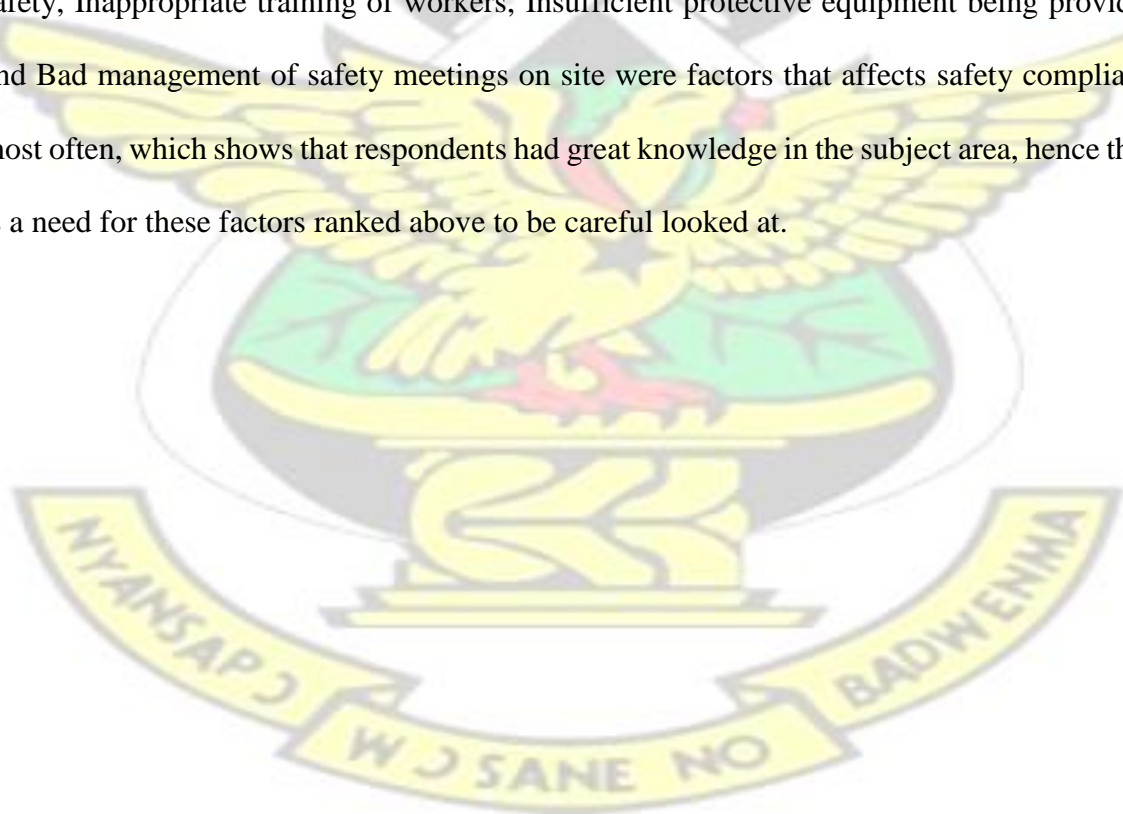
<b>Factors</b>	<b>Mean</b>	<b>Std. Deviation</b>
Low level of knowledge on health and safety	4.79	.536
Inappropriate training of workers	4.73	.448
Insufficient protective equipment being provided	4.63	.742
Bad management of safety meetings on site	4.50	.897
Unsafe attitudes of workers	4.15	.415
Health and safety regulations being inaccessible	4.02	.464
Inadequate record keeping for accident occurrences	3.92	.555
Issues regarding safety are not respected	3.31	.643
Poor management of commitment	2.29	.977
Low zeal from stakeholders to put in effort for health and safety in mining industries to stand	1.40	1.071

Source: Field Survey, 2019

From the table 4.6 above, the researcher delved into a literature review and was able to identify some factors affecting health and safety compliance of mining projects in the mining industry.

These factors were presented to the respondents to rank and these factors were ranked as

expected from the respondents, and from the table, and with the help of the Mean score ranking five of the factors were ranked high, these factors included the following respectively; Low level of knowledge on health and safety (4.79), Inappropriate training of workers (4.73), Insufficient protective equipment being provided (4.63), Bad management of safety meetings on site (4.50), Unsafe attitudes of workers (4.15). These factors ranked, were agreed on by the respondents that they are really factors that affects health and safety compliance in the mining sector. From the table below, two of the factors were ranked very low and these factors were; Poor management of commitment with a mean score of (2.29) and Low zeal from stakeholders to put in effort for health and safety in mining industries to stand, with a mean score of (1.40). In the literature review according to Teo et al. (2005) Low level of knowledge on health and safety, Inappropriate training of workers, Insufficient protective equipment being provided, and Bad management of safety meetings on site were factors that affects safety compliance most often, which shows that respondents had great knowledge in the subject area, hence there is a need for these factors ranked above to be careful looked at.



## CHAPTER FIVE

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 INTRODUCTION

This chapter presents a conclusion showing the key findings together with probable recommendations to support further research. The main substance of the study has been discussed from the first chapter to the final fourth. Successively, a critical review of the research objectives was directed giving a detailed clarification and description of how these objectives were attained. The main findings and the adding up to knowledge in this study were also offered in this chapter. The chapter finished with the conclusion, recommendations and direction for further research based on the limitations and conclusion of the research.

#### 5.2 SUMMARY OF THE RESEARCH OBJECTIVES

The study aimed to research on the factors affecting the safety compliance of mining projects in the mining industry of Ghana, together with examining the level of health and safety compliance of mining projects in the mining industry of Ghana and to identify the factors affecting health and safety compliance of mining projects. The summary of the various objectives are presented below:

##### **5.2.1 Objective 1; To examine the level of health and safety compliance of mining projects in the mining industry of Ghana.**

In other to examine the level of health and safety compliance of mining projects in the mining industry of Ghana, a questionnaire was developed with a Likert scale rating from one to five. In line with the review of literature, the factors recognized were made available to respondents. In analyzing the data received from the respondents, the Relative Importance

Index was used and the actual level of health and safety compliance of mining projects were presented, this includes: “there is a reality of occupational health and safety policy in your company, records for accident occurrences are well kept, accidents are reported to the proper agencies and lastly, the records of accidents are well managed and used in educating others”. The study showed the extent that which health and safety compliance has attained in the mining company. The rest of the statements were also ranked respectively. From the findings in the analysis of the study, levels like “Health and safety committee is established” was ranked very low, which means the mining company must ensure to work on their safety committees to ensure that its well establish. This objective for the study was achieved.

**5.2.2. Objective 2; To identify factors affecting health and safety compliance of mining projects in the mining industry.**

Existing literature was reviewed on the factors affecting health and safety compliance of mining in the mining industry. From the literature attained, confident factors affecting health and safety compliance of mining projects were presented to respondents in the questionnaire developed. The Mean score ranking was used to analyze the data gotten from the respondents in this very objective. Some of the factors affecting health and safety were ranked as very crucial and these were: Low level of knowledge on health and safety, Inappropriate training of workers, Insufficient protective equipment being provided, Bad management of safety meetings on site, and finally, Unsafe attitudes of workers and Health and safety regulations being inaccessible. All other factors affecting health and safety compliance were also ranked. But from the results, the researched was able to identify the main factors affecting health and safety compliance, in which these factors were ranked high.

### **5.3 CONTRIBUTION TO KNOWLEDGE**

A Fourth Quarter Police Reports in 2012 identified lots of accidents that has led to disabilities and fatalities, in which shows the importance of this study in finding out the factors that affects safety compliance in the mining and construction industry. However, the main contribution to knowledge entails: the extent at which health and safety compliance has reached in mining projects in the mining industry of Ghana. Finally, the study adds up to literature on the key factors affecting health and safety compliance of mining projects in the mining industry and strategies to use in minimizing this factors were also presented in the study even though it wasn't an objective.

### **5.4 CONCLUSION**

In conclusion, the main aim of the study was to identify the factors affecting health and safety compliance of mining projects in the mining industry. The following objectives were attained at the end of the study and this includes the level at which health and safety compliance has reached in mining projects in the mining industry of Ghana and also the factors affecting health and safety compliance of mining projects in the mining industry. The study continued in the literature by adding up the strategies to minimize these factors which are affecting safety compliance in the mining industry. The various demographics of respondents also proved that the respondents (staff of Asanko Gold Mine in the Ashanti region) selected had much knowledge in the area of study. All factors were well ranked. And at the end of the study, from the summary above, we realize that the study was able to attain the most important factors under each objective. In all, the study concluded that Low level of knowledge on health and safety, Inappropriate training of workers, Insufficient protective equipment being provided

and Bad management of safety meetings on site are the main factors affecting health and safety compliance. The various recommendations of the study are stated below, in which brings the study to a successful completion.

## **5.5 RECOMMENDATIONS TO THE STUDY**

- Mining industry management must ensure to develop an effective safety reporting system
- Ensure to execute full verification of safety performance, processes and programmes against approved standards
- Bring out a package for tracking and analyzing jobsite accidents
- Ensure continual involvement of contractors, management and safety and health practitioners to enhance safety performance
- Ensure that work environment is well maintained to approved Health and Safety Standards
- The study recommends that there should be adequate training of health and safety provided to workers
- Sufficient supply of protective equipment and also much understanding on why this equipment“s must be used during the execution of work

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**APPENDIX**

**QUESTIONNAIRE**

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY  
COLLEGE OF ART AND BUILT ENVIRONMENT DEPARTMENT OF BUILDING  
TECHNOLOGY QUESTIONNAIRE**

**Topic: Factors affecting the safety compliance of mining projects in the mining industry of Ghana. A case study of Asanko Gold Mine.**

## **INTRODUCTION**

Health and safety is known as the important aspect relating to employment responsibilities at every field of work, especially in the mining and construction industry. Which is why this study finds it relevant to find the factors affecting the safety compliance of mining projects in the mining industry of Ghana. A case study of Asanko Gold Mine. And this questionnaire is to present certain factors relevant in regard to the area of the study and with the help of respondents the main aim of the study will be achieved. I assure you that this is only for academic purpose and the information obtained from this questionnaire shall be kept confidential. I would like to express my gratitude as you participate in answering these questions.

Emmanuel King-Gyam

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**Email:** kinggyam@yahoo.com

## **QUESTIONNAIRE**

### **GENERAL INFORMATION**

#### **PART ONE: DEMOGRAPHIC CHARACTERISTICS OF RESPONDANT**

Please duly respond to this questionnaire based on actual experience and please answer by ticking [ ✓ ] the appropriate cell.

1. Gender?

Male ( )    b. Female ( )

2. How many years have you worked in your company?

Less than 2yrs ( )    2-5yrs ( )    6-10yrs ( )    more than 10yrs( )

3. How long have you been working in your present capacity?

Less than 3 years ( )      3 to 5 years ( )

5 to 7 years ( )      Over 7 years ( )

4. What is your level of education?

HND/CTC ( )      Degree ( )      Postgraduate ( )      PhD ( )

**PART TWO:** This section presents examining the extent of level of health and safety compliance of mining projects in the mining industry of Ghana. The questions below from the literature in helps to identify the extent to which health and safety compliance of mining projects has been considered. (Please tick [  ] the suitable box).

**Strongly Disagree = (1), Disagree = (2), Neutral = (3), Agree = (4), Strongly Agree = (5)**

No.	Extent	1	2	3	4	5
1	Records of accidents are kept in the company					
2	Full medical coverage provided for workers					
3	Accidents are reported to the proper agencies					
4	There a reality of occupational health and safety policy in your company					
5	Regular evaluation and monitoring of work safety performance					

6	Health and safety regulations are made very understandable					
7	Proceedings for accident occurrences are well kept					
8	Health and safety committee is established					
9	Protective equipment are well provided					
10	Health and safety training programs are well organized					
	<b>If any other, please specify</b>					

**PART THREE: FACTORS AFFECTING HEALTH AND SAFETY COMPLIANCE OF MINING PROJECTS IN THE MINING INDUSTRY.**

From the literature review, a number of factors have been identified as the factors affecting health and safety compliance of mining projects in the mining industry. From your experience, please express your views on the following factors listed below. (Please tick [✓] the suitable box).

**Key: Strongly Disagree = (1), Disagree = (2), Neutral = (3), Agree = (4), Strongly Agree = (5)**

No.	FACTORS	1	2	3	4	5
1	Issues regarding safety are not respected					
2	Unsafe attitudes of workers					
3	Poor management of commitment					
4	Inappropriate training of workers					
5	Low level of knowledge on health and safety					
6	Health and safety regulations being inaccessible					
7	Inadequate record keeping for accident occurrences					
8	Low zeal from stakeholders to put in effort for health and safety in mining industries to stand					
9	Insufficient protective equipment being provided					
10	Bad management of safety meetings on site					
	<b>If any other, please specify</b>					

**THANK YOU**