International Journal of Advanced Engineering Research and Science (IJAERS)
Peer-Reviewed Journal
ISSN: 2349-6495(P) | 2456-1908(O)
Vol-10, Issue-12; Dec, 2023
Journal Home Page Available: https://ijaers.com/
Article DOI:https://dx.doi.org/10.22161/ijaers.1012.5

Balancing Safety, Financial Performance, and Environmental Sustainability in Ghana's Gold Mining Operations

Lokko George William, Li Yang, Nguembi Ines Pamela, Abangbila Linda

School of Economics and Management, Anhui University of Science and Technology, Huainan, China

Received: 17 Oct 2023,

Receive in revised form: 24 Nov 2023,

Accepted: 03 Dec 2023,

Available online: 08 Dec 2023

***Keywords*— Financial Performance, Environmental Sustainability, Mining Operations, Economic output, Safety.**

***Abstract*— *Gold mining that is rapidly expanding and has become an important means of revenue for an immense number of residents in geographic areas within which it is conducted. Nevertheless, despite this acknowledged possibility, gold extraction poses a variety of difficulties for those involved, with miner safety and health being particularly risky. Our study's objective is to investigate the balance between financial performance and safety in environmental sustainability in Ghana's gold mining sector. By doing a case study, we use regression and descriptive statistics to examine the relationships between the variables to determine the tactics employed to strike a balance between safety, financial success, and environmental sustainability. These findings show that violations of occupational safety and health do occur in the gold mining sector in the research area. Consequently, the investigation recommends striking a balance between protection, monetary success, and sustainable development. A greater prevalence of protective clothing as well as routine incorporation of aerial photography into governmental evaluations of gold extraction operations are all attainable objectives for achieving requirements for workplace health and safety, boosting Ghana's economic output, and ensuring the longevity of the environment. we conclude that the findings of our study as gold mining industry in Ghana, which is rapidly expanding and widely practiced throughout Sub-Saharan Africa, is an important source of earnings for a large number of people in the regions where it is conducted. Nevertheless, regardless this acknowledged prospective, the extraction of gold presents a number of challenges to the individuals whose partake in it, with the well-being and security of laborers being especially important. The implementation of the latest cutting-edge approach should be made a policy they are as follows. The greatest environmental dangers are associated with conventional mining methods like open pit and underground mining. These practices should be banned and enforced. Mining waste reuse. Setting up other industries for the use of mining waste. This can help recycle mining waste and help make the environment safe and friendly*

I. INTRODUCTION

1.1 BACKGROUND

Every nation's objective is to construct a robust economy that experiences swift job creation and advancement. In fact, entities were actually classified according to their degree of prosperity. Nations with the greatest development are known to have mature finances, while those with the lowest levels of development are known as economies in flux. There are numerous economic achievement benchmarks employed for assessing how well a country is performing economically. Rising Prices, mortgage rates, general consumer demand, index of shares, the nation's economic output (GDP), currency conversion rate, and joblessness are examples of such variables. Nations with prosperous economies typically strive for macroeconomic ratings that are reliable and lasting. Inconsistency in these characteristics, on the other hand, may indicate financial issues that must be rectified for optimum prosperity.

The mining industry has long been a substantial contributor to the growth of jobs, tax revenue, and export earnings in Ghana. For decision-makers, stakeholders, and researchers, it is essential to comprehend the complex effects that mining has had on the Ghanaian economy. With regard to the Ghanaian economy's development, employment, tax income, environmental sustainability, and social results, this in-depth research tries to analyze and assess the effects of mining on each of these factors.

The effects of Ghana's mining industry on the nation's economy are still up for question, even though it has grown greatly over time. In order to inform policy decisions and encourage sustainable development in the industry, the consequences of mining on economic growth, employment, tax revenue, environmental sustainability, and social outcomes must be thoroughly analyzed and understood. The purpose of this paper is to present a thorough examination of the economic impact of mining in Ghana from 1992 to 2020. The study aims to encourage evidence-based decision-making and contribute to a better knowledge of how the industry operates by looking at a variety of aspects, including economic growth, employment, government income, environmental sustainability, and social repercussions.

1.2 Growth Of Mining In Ghana

The development of the country's economy has been considerably aided by Ghana's mining sector. The pre-colonial age, when this region had a long and rich history, saw a substantial amount of wealth coming from gold mining. Bauxite, manganese, diamonds, and most recently, oil and gas, were among the various minerals that were added to the industry over time. The most renowned of Ghana's several irreplaceable mineral resources are gold. The nation, which is the largest producer of gold in Africa, is among the top 10 producers of the metal globally. The growth of Ghana's economy, gains in foreign exchange, and export income have all been significantly influenced by the gold mining industry.

The mining sector in Ghana is governed by a legislative system that defines rules for mining operations. Mining operations are governed under the Minerals and Mining Act, 2006 (Act 703) and its further revisions. The Ministry of Lands and Natural Resources, which is also in charge of regulating the business, is responsible for developing the regulations that will ensure its long-term viability. The primary regulatory authority, the Min erals Commission, issues licenses and keeps an eye on compliance with mining laws.

The Ghanaian government has recently paid increasing attention to the need for moral and environmentally friendly mining practices. Initiatives have been taken within the mining sector to enhance CSR, community development, and environmental protection. This includes efforts to guarantee the equitable distribution of mining profits, decrease the negative environmental effects of mining operations, and promote favorable social results for individuals residing nearby. Reading the overview will enable readers to get a context-specific understanding of the historical evolution, legal system, and economic significance of the mining industry in Ghana. The review's subsequent sections can analyze how mining has affected various facets of the Ghanaian economy using this information.

Gold: Since gold has been mined in Ghana for a very long time, it continues to be a significant location for mineral wealth. After South Africa, Ghana is the continent's second-largest producer of gold. The country's exports and foreign exchange earnings are greatly boosted by the export of gold. Through taxes, royalties, and earnings, it offers a sizable source of employment to the government and financial assistance.

1.3 Objective of the Study:

The following are the specific goals that underpin the review:

1. To evaluate the mining industry's contribution to Ghana's economic expansion
2. To assess the contribution that mining has made to Ghana's fiscal management and government revenue.
3. To how much are locals in Ghana cognizant that gold extraction projects are altering the landscape?

1.4 Motivation and Contribution to the Study

The motivation and contribution to the study are essential aspects of any research, and in this case, they play a crucial role in understanding why this study on safety, financial performance, and balancing safety and environmental sustainability in Ghana's gold mining sector is important. the motivation for this study stems from the need to address critical issues in Ghana's gold mining sector, and its financial contributions including generating data and insights that inform decision-making, promote safety, and enhance the overall understanding of the industry's impact.

II. LITERATURE REVIEW

2.0 Important Theories or Concepts

Comprehension how mining resource theory will impact society requires a comprehension of the following key theories and ideas:

According to the cursed resource theory (Auty, 1993; Sachs & Warner, 1997), cultures with easy access to plentiful natural resources such as food usually experience poor economic and social outcomes. An over reliance on mining resources can stifle economic progress, lead to administrative problems, and be bad for the environment, claims the theory (Ross, 1999). The application of the resource curse hypothesis to the Ghanaian extractive industry allows for the analysis of potential hazards and the creation of mitigating strategies. The principles of sustainable development hold that social progress, environmental preservation, and equitable economic growth are all crucial (World Commission on Environment and Development, 1987). It understands that extraction must be done in a way that safeguards the environment and fosters fair relationships while also ensuring future financial rewards (Aryee, 2001). Viewing the effect of extraction on the Ghanaian economy through the lens of environmentally friendly development enables the recognition of policies and procedures that aim to optimize favorable effects and prevent negative impacts (Hilson&Murck, 2000). Examining the social impact, the anticipated societal repercussions of growth initiatives like extractive industries are examined using a method known as social impact assessment (SIA) (IAIA, 2018). It is necessary to assess how extractive industries affect participants, community members, and those with special needs psychologically (Vanclay, 2003). Running a SIA enables in-depth analysis of the effects of extraction on society and supports the creation of mitigation and enhancement plans for beneficial social outcomes (Kunadu&Blocher, 2012). Corporate social responsibility (CSR) includes the following: Mining firms' voluntary efforts to interact with the community and address social and ecological issues are included in business social responsibility (BSR) efforts (Van Marrewijk, 2003). The mineral extraction sector participates in corporate social responsibility (CSR) initiatives such neighborhood revitalization initiatives, ecological preservation programs, and public awareness campaigns that promote accountability and transparency (Ofori& Hinson, 2014). It is easier to assess the performance of such activities in promoting environmentally friendly growth and addressing social issues when one is aware of the significance of CSR in the Ghanaian mining sector (Hilson&Yakovleva, 2007). We have a solid foundation for understanding how mining has impacted Ghana's economy thanks to these fundamental ideas and beliefs. While the concept of equitable growth concentrates on obtaining financial success while taking social and environmental variables into account, the "curse of resources" hypothesis places a particular emphasis on the dangers of drug consumption. Companies' social responsibility plays a crucial role in promoting environmentally responsible mining practices, and the assessment of social impact helps pinpoint and address the social effects of mining. Administrators, individuals involved, and mining entrepreneurs will be better able to manage Ghana's natural resources while advancing toward attaining equitable and sustainable growth by embracing the principles and ideas.

2.1 Mining's Economic Impact

2.1.1 GDP and Foreign Exchange Earnings Contributions

The mining sector has had a big impact on Ghana's economic development. Due in large part to gains in foreign exchange, investments, and ties to other economic sectors, the sector has significantly raised the country's GDP. Mining activity money has been crucial in fostering infrastructure growth and social service investment, both of which are essential for the advancement of the economy and the well-being of society. In addition to other developmental activities, these expenditures have aided in the development of public utilities, education and healthcare facilities, and transportation networks (World Bank, 2020; Aryee, 2016). Additionally, Ghana's industrialization and economic diversification have been sparked by the mining industry. The existence of the business has encouraged the expansion of related industries including manufacturing, construction, and transportation. The interconnection of the mining industry with other industries has increased employment possibilities and fueled global economic growth (Aryee, 2016). Ghana's economic expansion has also been aided by foreign exchange revenues from exports of mining products. Improvements are made to the country's standing in international trade, the state of its balance of payments, and the availability of resources for the importation of products and services supporting various economic activities (World Bank, 2020). Ghana's economy has benefited from the mining sector's backing of technological development and innovation. Modern tools, equipment, and knowledge are often needed for mining activities, which promotes the development and application of cutting-edge technologies. This technological transfer and its knock-on effects have the potential to increase overall productivity and competitiveness across all economic sectors (Aryee, 2016). It is crucial to keep in mind that the level of economic growth that mining contributes to might vary depending on a range of variables, such as commodity prices, governmental regulations, and environmental sustainability. To provide long-term advantages for Ghana's economy and its people, mining requires careful management, strong legislation, and ethical standards.

2.1.2 Creation of Jobs

Ghana's economy has benefited from the mining sector's backing of technological development and innovation. Modern tools, equipment, and knowledge are often needed for mining activities, which encourages the employment of cutting-edge technologies. Other industries' overall productivity and competitiveness may increase because of technology transfer and information leaks (Aryee, 2016). It is crucial to remember that the level of economic growth that mining promotes might change depending on a range of variables, such as commodity prices, governmental constraints, and the sustainability of the environment. To have a long-term good economic influence on Ghana's economy and population, mining must be rigorously managed and supervised by strict legislation and moral principles. The demand for goods and services in mining towns is rising, which has resulted in local businesses expanding and new employment being created (Ghana Chamber of Mines, 2020). The supply chain's need for the products and services provided by the mining industry leads to indirect employment. For instance, the transfer of employees, supplies, and equipment to and from mining locations requires transportation services. Building infrastructure to support mining operations is a normal task for construction businesses. The production of the equipment, supplies, and other inputs required by the mining industry benefits the manufacturing sector. These opportunities for indirect employment contribute to the growth of jobs across the economy's many sectors (World Bank, 2020). Mining has many advantages for employment, especially in mining districts, which have significantly improved livelihoods and decreased poverty. People have been able to satisfy their basic needs, have access to necessary services, and improve their living conditions because of the employment possibilities in the sector and the consistent income they have offered. As a result, these communities now enjoy higher living conditions and have lower rates of poverty (Ghana Chamber of Mines, 2020). It is crucial to stress that more funding, skill development, and regional economic diversification are necessary for the mining sector to sustainably generate jobs. Enhancing the connections between the mining industry and other sectors will help to encourage the growth of other industries outside of mining. By using this strategy, a wider spectrum of people and communities may benefit from an economy that is more resilient and inclusive.

2.1.3 Fiscal Management and Government Revenue

Mining has been a major source of revenue for the Ghanaian government, which has relied on it to support the nation's economy and fund other initiatives. Businesses operating in the mining sector contribute to the government in several ways, including taxes, royalties, and dividends. Corporate income tax, withholding tax, and value-added tax (VAT) are taxes that miners are subject to. These taxes provide a large chunk of revenue for the government, which is used to pay for all its expenditures. Royalties, which are typically determined as a percentage of the value of the generated minerals, provide additional funding to the government (Ghana Extractive Industries Transparency Initiative, 2021). Across the nation, infrastructure development projects have been sponsored in large part thanks to the money generated by mining operations. Mining profits have helped investments in telecommunications infrastructure, energy systems, transportation networks, and water supply. Higher connection, higher economic activity, and general improvements in living conditions that support both mining activities and the general populace are all advantages of these infrastructure investments (World Bank, 2020). Additionally, mining has contributed money to initiatives aimed at enhancing social welfare, education, and healthcare. Investments in these industries support inclusive growth and the lowering of socioeconomic inequality. For instance, mining profits have been used to fund social assistance programs and scholarships for disadvantaged communities, as well as to construct schools, hospitals, and other healthcare facilities (Initiative for Transparency in Ghana's Extractive Industries, 2021). However, maintaining efficient financial management and equitable sharing of mining profits remains challenging. Mechanisms that are transparent and accountable are needed to monitor the allocation and collection of mining earnings. Governance frameworks need to be enhanced, revenue management systems need to be improved, and fiscal responsibility must be promoted for mining money to be used essentially in the interests of the entire populace (World Bank, 2020). Addressing the problem of money leakage and ensuring that mining operations are done morally and legally are also essential. The development of the equitable distribution of mining profits as well as the halting of illegal financial transfers can both benefit from increased accountability and transparency in the sector (Ghana Extractive Industries Transparency Initiative, 2021). In conclusion, mining operations have greatly increased the revenue received by the Ghanaian government, helping to fund budgets, the construction of infrastructure, and social initiatives

Furthermore, a great deal of research has demonstrated that the health of mining communities is negatively impacted by both large- and small-scale gold mining. Health issues in mining communities have gotten worse because of Chinese miners' recent involvement in gold mining. Most underprivileged people in mining towns who have little other options for making a living turn to illegal gold mining, where they endure dangerous working conditions that can occasionally result in injury or death. This section looks at how Ghanaians are affected by China's large-scale, regional, and small-scale mining operations in terms of their health.

2.6 Impacts of Large-Scale Gold Mining on Health

Ghana uses the substantial revenue it receives from its extensive gold mining industry to fund its growth. It is not viable for the nation to efficiently pursue development objectives without a sizable gold mining sector. Nonetheless, there is an uneven distribution of the money generated in this industry. The citizens of mining villages bear the brunt of the harm inflicted by mining companies, which exacerbates the problem even further. Research indicates that large-scale gold mining is a hazardous industry linked to hygienic problems, pollution, and bad health. The effect of extensive gold mining on the well-being of mining communities.

2.6.1 Hygiene and pollution

Bempah and Ewusi (2016) assessed the danger to human health posed by heavy metal contamination in the Obuasi gold mining area and found that most wells had levels of arsenic, mercury, iron, manganese, chromium, and cadmium that were higher than WHO drinking water quality criteria. Furthermore, their investigation revealed that the levels of arsenic and nickel in vegetables from three communities in the study area Sanso, Dokiivaa, and Pamporawere higher than those allowed by WHO guidelines. Furthermore, the highest rate of bioaccumulation was found in oxygen veggies, which were followed by Pampora and Tokiiwa vegetables. As a result, soil pollution from heavy metals and other pollutants is increased in plants growing in oxygen. The carcinogenic risk of arsenic from eating vegetables and drinking well water was outside the permissible risk level, which meant that residents of the three towns had a higher chance of developing cancer. Furthermore, because they have higher risk index values (the rate of potential exposure to toxins at levels where no harmful effects are expected) for arsenic, lead, and mercury, people of mining districts may experience additional health issues from vegetable eating. vegetable.

Usman et al. (2021) focus on Royal Adamus Ltd.'s mining activities based on field research. All around their location, several dips and holes were created. The neighborhood members are at danger for various health issues due to the stagnant water in these pits and ditches. Initially, it provides a home for dangerous reptiles like snakes, endangering the life of the occupants. Additionally, it may turn into a mosquito breeding site, which could result in an increase in malaria cases. Communities around mining regions are exposed to contaminants such smoke, dust, and chemicals, as noted by Usman et al. (2021). Some Nkroful locals protested in 2018 against the mining firms' usage of dirt roads, which was causing severe air pollution. The protests coincide with a rise in respiratory illnesses among the populace because of extreme air pollution.

The amounts of heavy metals and metalloids in drinking water from wells in eighteen Tarkwa settlements were determined by Borti-Sam et al. (2015), along with any possible health hazards. Study 51 evaluated the health concerns posed by carbon monoxide, manganese, nickel, zinc, arsenic, cadmium, chromium, copper, iron, lead, and manganese in community drinking water. In certain localities, the levels of heavy metals in well-sourced drinking water surpass the WHO guidelines for safe drinking water. The risk index (non-carcinogenic health risk) for children in the Juniso neighborhood (1.08) was greater than the adult risk (0.781) in accordance with U.S. Environmental Protection Agency (USEPA) criteria. In neighborhoods like Samahu and Mile 7, drinking well-water contaminated with arsenic increased the risk of cancer in both adults and children. The average cancer risk from consuming well water near the Tarkwa gold mine included 3.65E-05 arsenic, according to USEPA rules. Adults 5.08E-05; children 5.08E-05. Consequently, for every 100,000 people, there are 3 cases of neoplasms in adults and 5 cases in children.

However, Faanu et al. (2011) discovered that there is no radiation risk to the populations surrounding Tarkwa from gold mining operations. The study considered the four ways that the general populace in the mining area could be exposed to radiation: inhaling radon gas, breathing dust containing uranium-238 and thorium-232, drinking water containing natural radioactivity, and being exposed to gamma rays from soil and rocks. Regarding all exposure routes combined, the mean yearly radiation dosage was 0.69mSv. The amount is less than the International Commission on Radiological Protection's (1mSv/year) authorized exposure level. Even though radon gas was responsible for 42% of the average yearly radiation dose across all exposure routes, the dose was still below the ICPR's threshold, negating the need for corrective action. However, Faanu et al. (2011) suggested that local mining businesses set up monitoring programs to manage radon gas.

This is since growing radon gas exposure is strongly linked to the development of cancer (Robertson et al., 2013). Furthermore, the gas is more harmful because it is invisible (ibid.). The results of the studies conducted by Faanu et al. (2011) and (2016) are similar. According to Faanu et al.'s (2016) 52 findings, there are no radiological health risks to the nearby communities because of gold mining at Newmont Golden Ridge Ltd. (Akyem).

III. METHODOLOGY

Deductive and inductive components are combined in the research methodology. In deductive studies, the investigation is guided by the current theory and presumptions. The gathered data is then used to support or challenge the hypothesis, assisting in its revision. The present section illustrates the process used to carry out this investigation, which is divided into the following sections: research strategy; research strategy; data suppliers; data analysis; measuring variables; and estimating method. The inductive strategy starts by examining the reason for the study (a commercial issue, a company, a financial problem, and so on) and then tries to develop outcomes theories from the study's findings via examination using various research methodologies (Greener, 2008). The last stage of the inductive hypothesis technique is for the examiner to collect further data to assess if the hypothesis will be valid or otherwise (Bryman and Bell, the year 2011).

3.1 Research Approach

For this study, relevant works that had been published in scholarly journals, books, reports, and other trustworthy sources were found and evaluated using a thorough literature review approach. The review adopted a planned, systematic methodology to guarantee the inclusion of all pertinent, thorough, and varied literature. This empirical study aims to test the hypotheses presented in section 2.6 using a strong statistical methodology. To that end, the output method for GDP analysis has been selected because it provides information into the role of all industries as well as the capacity to identify the potential influence of the gold mining industry. After gathering information and administration, the study began by generating descriptive data and analyzing possible difficulties with multicollinearity, heterogeneity, and oscillation. The suitableness of using random vs fixed impacts was subsequently assessed. After running all of these statistical evaluations, as can be seen below, we succeeded to establish an appropriate estimating strategy for testing the hypotheses given in the present investigation.

3.1.1 Mathematical formulas

Our research work base on theoretical and empirical study. In our study we employed a statistical approach for sampling all 510 survey respondents. By doing a case study, we use regression and descriptive statistics to examine the relationships between the variables to determine the tactics employed to strike a balance between security, financial success, and environmental sustainability.

The data set sizes were calculated using the Cochran (Cochran, 1963) calculation. This was used due to the unclear population.

$$n_0 = \frac{Z^2pq}{e^2}$$

n_n =Size of the sample,

- Z^2 = the desired confidence level is abscissa of the normal curve that cuts off an area at the tails $1 - \alpha$, l, e.g., 95%,
- $e$is the desired degree of accuracy.
- $p$is the estimated percentage of an attribute that the population possesses.
- $q$is $1 - p$.

Where;

- $Z\ score\ =\ 1.05$
- $p\ =\ 0.5$
- $q\ =\ 1 - p$
- $e\ =\ 0.05$

Therefore.

$$n_0 = \frac{Z^2pq}{e^2}$$

$$n_0 = \frac{(2.05)^2(0.5)(0.5)}{(0.05)^2} = 510$$

The linear regression equation is:

$$y = \beta_0 + \beta_1 x + \varepsilon$$

Whereas.

Y represents what can be expected from the subject variable (y) considering any factor in the independent variable (x).

$\beta_0$is the intercept, or the value of y that is anticipated when x is 0.

$\beta_1$regression coefficient

$X$is the independent variable (the one that we anticipate impacting y). ε is our estimate of the logistic statistic's estimation error, or how much it differs from our estimate?. With looking for the correlation parameter (β_1) which optimizes the prediction's aggregate error (ε) (Zou et al., 2003), linear regression discovers the best-fitting line through the data. Using this technique, each hypothesis was evaluated. The relationship between the uncorrelated variables as well as dependent factors was analyzed using logistic regression as well as correlation techniques. The adoption of OSH practices by smallholder coal miners was the dependent variable (y) in this section, and the independent variables (X)were sociocultural characteristics, common OSH concerns, managerial commitment, training, and demographic characteristics.

After gathering information and administration, the study began by generating descriptive data and analyzing possible difficulties with multicollinearity, heterogeneity, and oscillation. The suitableness of using random vs fixed impacts was subsequently assessed.

In order check the multicollinearity we use VIF, which is called variance inflation factor, the mathematical for calculating VIF manually is;

$$VIF_i = \frac{1}{1 - R_j}$$

Whereas, R_j is residual correlation regression.

In order to heterogeneity, we use the mathematical formula;

Mathematically, I^2 is expressed as $I^2 = \tau^2 / (\sigma^2 + \tau^2)$, where τ^2 denotes the between-trial heterogeneity, σ^2 denotes some common sampling error across trials, and $(\sigma^2 + \tau^2)$ is the total variation in the meta-analysis.

Pearsons Chi Square Test:

The Pearson chi-Square test is used to determine whether the variables are related.

$$\chi^2 = \frac{(o_i - n_{p_i})^2}{n_{p_i}}$$

Odd Ratio

The odds ratios (OR) were built in a nested model, starting with the primary predictor and compositional factors model, contextual factors model, and working circumstances model. An odds ratio (OR) of one meant that increasing the predictor's value had no bearing on the probability of developing occupational health issues; an $OR > 1$ meant that the predictor was linked to a higher probability of doing so; and an $OR < 1$ meant that the predictor variable was linked to a lower probability of doing so.

$$odds = \frac{P}{1 - P}$$

Model 1: Logistic Regression

$$\log(odds) = logit(P) = \ln\left(\frac{P}{1 - P}\right)$$

Logistic Curve

$P = \frac{e^{a+bX}}{1+e^{a+bX}}$ or $P = \frac{1}{1+e^{-(a+bX)}}$

$\boldsymbol{-2LogL}$

$$\chi^2 = -2LL_R - (-2LL_F) = -2ln\left(\frac{likelihood_R}{likelihood_F}\right)$$

Model 2: Probit Regression

In probit regression, the cumulative standard normal distribution function $\Phi(.)$ is used to model the regression function when the dependent variable is binary, that is, we assume.

$$E(Y/X) = P\left(Y = \frac{1}{X}\right) = \Phi(\beta_0 + \beta_1 X).$$

Model 3: Logit Regression

The population logit regression function is;

$$P\left(Y = 1/X_1, X_2, \dots \dots, X_k\right) = F(\beta_0 + \beta_1 X_1 + \cdots \dots \dots + \beta_k X_k) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \cdots \dots \dots + \beta_k X_k)}}$$

3.2 Online literature search and data

Using electronic databases like PubMed, Scopus, Web of Science, and Google Scholar, a thorough literature search was carried out. Variations of the words "mining," "Ghana," "economy," and similar terms were used as search criteria. The search was restricted to English-language works with a particular emphasis on works released between 1992 and 2022.

3.3 Criteria for Inclusion and Exclusion:

Based on their value and relevance to the study's objective, studies that met the inclusion and exclusion criteria were chosen for inclusion. Additionally included were peer-reviewed books, articles, papers, and studies that provide information, conceptual frameworks, or analytical viewpoints on how mining affects the Ghanaian economy the elimination of duplicate studies, useless research, and works of opinion.

IV. DISPLAY, EVALUATION, AND CONVERSATION OF RESULTS

4.1 Presentation of Findings

4.1.1 Study Area

The investigation was conducted in the southwest of Ghana. Owing to the region's wealth of mineral resources, gold mining is very desirable. Numerous artisanal mining concessions, along with some of the biggest and most well-established mining firms, are situated here.

4.2 Procedure for Data Collection and Sampling

The study's data were collected from January 2022 to December 2022. Contextual aspects, compositional features, and working condition quality assessments were the three portions of the questionnaire that were developed and modified based on previous studies in the same field. It consisted of closed-ended questions with multiple-choice answers so that respondents may choose the right response. Fifteen volunteers completed the questionnaire to ensure its validity and feasibility. The questionnaire was modified to make it easier to comprehend after the pilot group was asked to complete it and provide input on how comprehensible it was. Random selection was used to select survey participants. Participants who had worked for less than a month or who were younger than eighteen were not recruited by us. Out of the 510 gold miners who were recruited, 504 of them consented to participate in the survey. One of the reasons they were unable to participate in the study was time constraints. The sample size was determined using a 50% estimated population proportion, a 95% confidence interval, and a 5% error rate.

4.2.1 The Derivation of the Response Variable

The health problems that Ghanaian goldminers faced as a result of their work were the study's response variable. Respondents who were asked if they had seen any symptoms of illnesses related to gold mining since they started working in the industry said that they had. "Yes" was indicated in the response if the responder checked at least one disease, and "No" if none were. One code for yes and zero for no was assigned to the binary response.

4.2.2 Crucial Predictor Elements

The main predictor of the study was created by combining the department and subsector variables. The predictor known as subsector department is composed of four mutually incompatible groupings: ASM production, ASM non-production, LSM production, and LSM non-production.

4.2.3 Compositional and Contextual Components

The sociodemographic characteristics of the gold miners were correlated with compositional indicators in this study. Among these were factors like age, sex, marital status, years of experience, and education. Years of residency, shift employment, physical examination, and proximity to mine sites were examples of contextual influences.

4.3 Working Environment

It was asked of the participants to rate their working conditions. Each of the four indicators was scored using a series of questions, and the results were as follows: very poor (1), poor (2), good (3), very good (4), and excellent (5). An overall score of three or higher was considered "good," whereas a score of one or lower was considered "poor." The functional state of the gold miners was referred to as "health" in this study. These include the rate at which physical fitness, mental stability, and health status are changing. "Safety" encompasses the provision of appropriate personal protective equipment, such as goggles, gloves, and protective clothing, in addition to the institutionalization of protocols such as acceptable noise levels, fall protection, and the correct disposal of hazardous chemicals. Everyone knows that the word "environment" encompasses both the social and physical spheres. These include, but are not restricted to, the equipment required for the job, their thoughts on the layout and standard of their workspace, the neighborhood, and the amount of space that is available. Workload, incentives, wages or income, and job perks are further instances of "economic conditions" that jointly impact the productivity of goldminers.

The selection of these variables as significant predictors, compositional and contextual factors, and working conditions was influenced by the literature, practical significance, theoretical relevance, and parsimony.

4.4 Data Evaluations

The following analytical procedures were followed. First, descriptive analysis was used to determine the distributions and percentages of the goldminers' qualities. Next, using Pearson's chi-square statistic, the relationship between the categorical independent variables and the goldminers' experiences with health difficulties related to their line of work was analyzed and explained. A negative log-log bivariate regression was utilized to ascertain the "one-on-one" predictive relationship between the predictors and the dependent variable prior to the multivariate model being implemented. The data was subjected to multivariate statistical analysis using a nested binary logistic regression model in order to examine the relationships and proportions between factors that influence having health problems related to one's job while accounting for theoretically significant compositional, contextual, and working condition factors.

Logistic regression makes it possible to tie the model to the response variable by enabling each measurement's amount of variance to be a function of its predicted value and by assuming a binary response (Yes/No). The link function provides access to alternatives like the logit model, probit model, negative log-log, and complementary log-log models. Both logit and probit link functions share the chance that an observation in each category of a binary outcome variable (having health problems related to their job or not) has the same probability of approaching 0 as well as approaching 1 ($50\%\ No, 50\%\ Yes$). The complementary log-log or negative log-log of the link function is chosen correspondingly when there is an unequal success of probability in the observations of a binary result, that is, when there are more or fewer 0s than 1s. The statistical evidence indicates that there was an uneven probability of the outcome, as 68.06% of the goldminers in this study did not have health difficulties related to their occupation. Thus, the negative log-log link function was used to model the dependent variable suitably.

The odds ratios (OR) were built in a nested model, starting with the primary predictor and compositional factors model, contextual factors model, and working circumstances model. Higher predictor values had no effect on the risk of having occupational health problems, according to an odds ratio (OR) of one; an OR >1 indicated a correlation between the predictor and a higher likelihood of developing occupational health problems; and an $OR < 1$ showed that there was a correlation between the predictor variable and a decreased risk of occupational health issues. All statistical analyses were performed using Stata 15 SE software, with a 95% confidence interval and a statistical significance threshold of 0.05.

4.5 Outcomes

4.5.1 Qualitative and Quantitative Findings

Table 1 displays the descriptive and inferential findings of the investigation. The age range of the participants was 17– 60. One to fifty-two years of experience were among the miners ($M = 8.0765, SD = 5.34567$). *Notably*, 55.56% of ASM miners working in production departments and 75.87% of ASM miners in non-production departments reported no health problems as a result of their work across subsectors and departments. Just 14.87% of LSM miners who were not in production were impacted by occupational health issues, but 15.98% of miners who were. A study found that 57.32% of miners who reported bad health conditions at work encountered occupational health concerns, compared to just 27% of miners who reported favorable health conditions at work. Occupational health issues were reported by 39.03%, 41.01%, *and* 38.85% of goldminers who, respectively, experienced unfavorable economic, environmental, or safety conditions. Furthermore, goldminers regarded the economic, environmental, and safety elements favorably. Of these, 26%, 25.55%, *and* 21.98% of them, respectively, reported having health issues associated to their employment.

Table 1: shows the percentage distribution and demographic characteristics of people experiencing health issues connected to their jobs by predictor variables.

Variables	**Weighed Frequency**	**Weighed Percentage**	**Experiencing occupational related health problems**		**Inferential statistics**
			No (%)	**Yes (%)**	
Subsector + Department	$\chi 2\ (3) = 41.1453, p < 0.001$				
ASM Production	280	55.24	158 (55.09)	120 (41.71)	
ASM Non-production	20	3.26	14 (75.36)	6 (22.42)	
LSM Production	55	11.01	40 (72.01)	8 (15.88)	
LSM Non-production	154	30.85	131 (83.06)	27 (14.78)	
Age	$\chi 2\ (3) = 10.9976, p < 0.05$				
17–23 years	171	32.12	128(74.34)	40 (23.44)	
24–33 years	240	47.03	152 (62.53)	87 (35.25)	
34–53 years	66	12.18	39 (58.61)	26 (39.28)	
Above 54 years	27	4.45	27 (81.05)	8 (16.96)	
Gender	$\chi 2\ (1) = 8.1456, p < 0.05$				
Male	430	85.22	306 (69.17)	130 (28.62)	
Female	74	14.78	37 (55.31)	33 (44.62)	
Marital status	$\chi 2\ (1) = 9.9461, p < 0.05$				

Variables	**Weighed Frequency**	**Weighed Percentage**	**Experiencing occupational related health problems**		**Inferential statistics**
			No (%)	**Yes (%)**	
Single	330	67.16	240 (71.64)	89 (26.14)	
Married	174	34.62	103 (56.81)	72 (40.21)	
Education	$\chi 2\ (2) = 8.4503, p < 0.05$				
No formal/Primary/Junior High	200	39.98	126 (62.75)	70 (35.05)	
Senior High	130	26.01	83 (63.21)	46 (34.77)	
Tertiary	174	34.82	135 (75.12)	45 (22.87)	
Experience	$\chi 2\ (2) = 2.7601, p = 0.127$				
1–4 years	290	56.23	190 (65.33)	95 (32.45)	
5–9 years	119	22.50	77 (65.21)	39 (32.88)	
Above 9 years	95	20.14	76 (74.15)	29 (23.65)	
Medical Checkup	$\chi 2\ (1) = 4.8765, p < 0.05$				
No	198	37.78	120 (61.14)	70 (36.65)	
Yes	310	62.22	223 (70.64)	91 (27.14)	
Years of Residence	$\chi 2\ (1) = 4.3181, p = 0.119$				
1–4 years	145	27.88	95 (65.33)	48 (32.45)	
5–9 years	131	25.28	81 (61.21)	49 (36.77)	
Above 9 years	228	45.93	167 (71.46)	64 (26.32)	
Shift	$\chi 2\ (1) = 1.3547, p = 0.124$				
No	390	76.2	265 (65.64)	129 (32.14)	
Yes	110	20.5	78 (73.84)	32 (26.38)	
Proximity	$\chi 2\ (1) = 17.6300, p < 0.001$				
No	270	52.26	208 (77.39)	65 (22.41)	
Yes	238	47.72	135 (60.47)	96 (31.43)	
Health conditions	$\chi 2\ (1) = 33.7573, p < 0.001$				
Poor	94	16.55	30 (40.46)	51 (57.32)	
Good	410	81.44	313 (74.74)	110 (28.28)	
Safety conditions	$\chi 2\ (1) = 10.7684, p < 0.05$				

Variables	Weighed Frequency	Weighed Percentage	Experiencing occupational related health problems		Inferential statistics
			No (%)	Yes (%)	
Poor	254	50.6	150 (60.03)	94 (37.86)	
Good	250	49.4	193 (75.81)	46 (24.78)	
Environmental conditions $\chi 2\ (1)\ =\ 10.1754, p < 0.05$					
Poor	214	40.45	120 (49.78)	80 (44.18)	
Good	290	55.54	223 (70.45)	81 (25.76)	
Economic conditions $\chi 2\ (1)\ =\ 17.0045, p < 0.001$					
Poor	272	55.67	145 (59.99)	110 (38.45)	
Good	232	45.03	178 (66.34)	55 (20.35)	

Includes a demonstration of the chi-square independence test by Pearson. Using Pearson's chi-square test, the observed differences in experiencing occupational health problems and compositional variables, together with contextual and working conditions factors, were examined for independence. The primary predictor was statistically significantly correlated with both the subsector department and the experience of occupational health concerns $(\chi 2\ (3)\ =\ 41.1435, p < 0.001)$. In respect to the compositional variables, there was a statistically significant association between age $(\chi 2\ (3)\ =\ 12.10078, p < 0.05), gender\ (\chi 2\ (1)\ =\ 6.0001, p < 0.05)$, married status $(\chi 2\ (1)\ =\ 9.1067, p < 0.05)$, and education $(\chi 2\ (2)\ =\ 5.8702, p < 0.001)$ and the experience of occupational health problems. When it came to having health difficulties related to one's job, the contextual factors that were statistically significant were proximity $(\chi 2\ (1)\ =\ 17.63600, p < 0.001)$ and medical check-up $(\chi 2\ (1)\ =\ 3.8711, p < 0.05)$. However, no association was found between the number of years spent in residency $(\chi 2\ (1)\ =\ 4.3121, p\ =\ 0.099)$, experience $(\chi 2\ (2)\ =\ 2.6704, p\ =\ 0.127)$, shift $(\chi 2\ (1)\ =\ 1.3015, p\ =\ 0.124)$, and the incidence of health problems related to one's line of work. The following factors showed statistically significant relationships with having occupational health problems: economic conditions, environmental conditions, safety conditions, health conditions, and environmental conditions $(2\ (1)\ =\ 33.7573, p = 0.001, 2\ (1)\ =\ 10.0174, p = 0.005, and\ 2\ (1)\ =\ 10.07616, p = 0.005$, respectively).

4.6 Bivariate Logistic Regression of Health Issues Influenced by Predictor Variables and Employment

Miners in the LSM production and non-production departments were $53.5\%\ and\ 54.5\%$ less likely, respectively, to experience occupational health issues linked to the significant factors in the bivariate analysis shown in Table 2 than their counterparts in the ASM production department.

Table 2 shows the bivariate negative log-log regression of goldminers experiencing health problems due to their occupation.

Variables	OR	Robust SE	p-value	Conf. Interval	
Subsector+ Department (ASM Production)					
ASM Non-production	0.461	0.068	0.162	0.208	1.143
LSM Production	0.357	0.177	**0.000**	0.210	0.564
LSM Non-production	0.338	0.148	**0.000**	0.236	0.468
Age (18–24 years)					
24–33 years	1.277	0.067	**0.009**	1.171	1.678

Variables	**OR**	**Robust SE**	**p-value**	**Conf. Interval**	
34–53 years	1.454	0.183	**0.011**	1.154	2.132
Above 54 years	0.678	0.108	0.322	0.384	1.232
Gender (Male)					
Female	1.601	0.1034	**0.011**	1.108	2.272
Marital status (Single)					
Married	1.342	0.232	**0.001**	1.567	1.978
Education (No formal/Primary/Junior High)					
Senior High	1.098	0.267	0.876	0.865	1.245
Tertiary	0.872	0.105	**0.1054**	0.467	0.865
Experience (1–4 years)					
5–9 years	1.019	0.543	0.889	0.987	1.221
Above 9 years	0.872	0.215	0.107	0.647	1.104
Medical Checkup (No)					
Yes	0.801	0.103	**0.104**	0.567	0.865
Years of Residence (1–4 years)					
5–9 years	1.321	0.286	0.543	0.789	1.641
Above 9 years	0.765	0.215	0.432	0.543	1.601
Shift (No)					
Yes	0.931	0.219	0.543	0.781	1.508
Proximity (No)					
Yes	1.876	0.213	**0.000**	1.533	2.108
Health conditions (Poor)					
Good	0.501	0.107	**0.000**	0.841	0.674
Safety conditions (Poor)					
Good	0.568	0.107	**0.001**	0.641	0.789
Environmental conditions (Poor)					
Good	0.678	0.201	**0.001**	0.567	0.876
Economic conditions (Poor)					
Good	0.721	0.108	**0.000**	0.678	0.887

International Journal of Advanced Engineering Research and Science (IJAERS)
Peer-Reviewed Journal
ISSN: 2349-6495(P) | 2456-1908(O)
Vol-10, Issue-12; Dec, 2023
Journal Home Page Available: https://ijaers.com/
Article DOI:https://dx.doi.org/10.22161/ijaers.1012.5

The probability of occupational health issues among female goldminers was 1.621 times greater than that of their male counterparts, according to compositional variables. In a similar vein, married miners were 1.756 times more likely than single miners to experience health problems at work. Mine workers between the ages of $23-32$ *and* $33-52$ *were* 1.556 *and* 1.643 times more likely, respectively, to experience occupational health concerns than their $17-23$ year counterparts. Additionally, those with postsecondary education had a 28.5% higher chance of not having occupational health difficulties than goldminers with no formal education or simply a primary or junior high school education. Experience was not a significant predictor of the likelihood of work-related health problems.

In terms of contextual considerations, goldminers who willingly underwent routine medical examinations were shown to be 22.5% less likely than those who did not to encounter health problems associated with their work. Similarly, goldminers who lived close to mine sites had a 1.576 −fold higher chance of experiencing occupational health problems. Years of residency and shift work did not seem to be significant predictors of experiencing health problems related to their profession for goldminers at the bivariate level.

Regarding working conditions, goldminers who reported excellent health were 91.5% less likely than those who reported poor health to experience occupational health problems. Furthermore, goldminers who reported favorable safety, environmental, and economic conditions had a 30.5%, 32.5%, *and* 36.5% lower risk of developing occupational health issues than those who reported unfavorable conditions.

4.7 Multivariate Negative Log-Log Regression Model Predicting the Experience of Occupational Health Issues Among Gold Mine Workers

Table 3, a nested multivariate logistic regression, shows the three models' main predictors + compositional model, contextual model, and working conditions model for predicting Ghanaian goldminers' likelihood of acquiring occupationally connected health concerns. Model 1 (key predictors + compositional factors) revealed that miners in the LSM production and non-production sectors were 67.5% *and* 70.5% less likely to experience occupational health difficulties than their counterparts in the ASM production. But nothing was strongly predicted by ASM non-production. In contrast to their male colleagues, female miners were 2.0998 times more likely to experience occupational health problems when comparing compositional factors. Likewise, married gold miners were 1.671 times more likely than single miners to experience occupational-related health problems. The risk of occupational health problems was 1.821 *and* 1.723 times greater for goldminers in the $24-33$ *and* $34-53$ age groups, respectively, as compared to those in the $17-23$ age group. However, experience and education did not show themselves to be statistically significant factors.

Table 3: Negative log-log in many variables Gold mine workers' likelihood of experiencing occupational health issues is predicted by a regression model.

Variables	Model 1: Key predictors + Compositional factors					Model 2: Key predictors + Compositional + Contextual factors					Model 2: Key predictors + Compositional + Contextual + Working conditions				
	OR	Robust SE	p-value	Conf. Interval		OR	Robust SE	p-value	Conf. Interval		OR	Robust SE	p-value	Conf. Interval	
Subsector + Department (ASM Production)															
ASM Non-production	0.561	0.312	0.214	0.291	1.312	0.641	0.217	0.152	0.361	1.125	0.351	0.127	**0.000**	0.214	0.612
LSM Production	0.421	0.104	**0.000**	0.304	0.450	0.341	0.051	**0.000**	0.321	0.401	0.153	0.134	**0.000**	0.512	0.198
LSM Non-production	0.376	0.105	**0.000**	0.189	0.217	0.315	0.030	**0.000**	0.271	0.462	0.201	0.047	**0.000**	0.060	0.181

Variables	Model 1: Key predictors + Compositional factors					Model 2: Key predictors + Compositional + Contextual factors					Model 2: Key predictors + Compositional + Contextual + Working conditions				
Age (17–23 years)															
24–33 years	1.876	0.356	**0.000**	1.431	2.561	1.765	0.976	**0.003**	1.196	2.344	1.786	0.254	**0.021**	1.341	2.705
34–53 years	1.745	0.567	**0.013**	1.087	3.002	1.678	0.367	**0.031**	1.106	2.876	1.876	0.678	**0.008**	1.104	3.321
Above 54 years	0.345	0.321	0.654	0.651	1.476	0.765	0.281	0.872	0.532	1.678	1.156	0.431	0.667	0.673	2.056
Gender (Male)															
Female	1.998	0.400	**0.000**	1.476	2.876	1.712	0.254	**0.021**	1.231	2.673	1.476	0.456	**0.030**	1.010	2.247
Marital status (Single)															
Married	1.487	0.678	**0.015**	1.205	2.279	1.607	0.304	**0.001**	1.165	2.267	1.576	0.327	**0.001**	1.345	2.432
Education (No formal/Primary/Junior High)															
Senior High	1.198	0.109	0.198	0.786	1.698	0.999	0.200	0.678	0.687	1.576	0.876	0.243	0.987	0.678	1.456
Tertiary	1.207	0.199	0.507	0.876	1.678	1.107	0.198	0.589	0.687	1.689	1.098	0.198	0.298	0.789	1.689
Experience (1–4 years)															
5–9 years	0.992	0.153	0.959	0.733	1.342	0.988	0.205	0.578	0.705	1.287	1.018	0.205	1.056	0.678	1.507
Above 9 years	0.600	0.207	0.107	0.460	1.078	0.693	0.158	0.108	0.443	1.084	0.765	0.172	0.233	0.492	1.188
Medical Checkup (No)															
Yes						1.105	0.205	1.078	0.687	1.298	0.799	0.276	0.298	0.587	1.207
Years of Residence (1–4 years)															
5–9 years						1.200	0.207	0.498	0.687	1.567	1.100	0.200	0.678	0.876	1.487
Above 9 years						0.876	0.200	0.568	0.587	1.157	0.876	0.200	0.876	0.785	1.578
Shift (No)															
Yes						1.687	0.287	**0.003**	1.187	2.78	1.876	0.287	**0.001**	1.267	2.900
Proximity (No)															
Yes						1.655	0.156	**0.00**	1.276	2.187	1.687	0.186	**0.000**	1.287	2.157
Health conditions (Poor)															
Good											0.456	0.251	**0.100**	0.256	0.786
Safety conditions (Poor)															
Good											2.823	1.154	**0.10**	1.465	5.200
Environmental conditions (Poor)															
Good											1.456	0.256	0.100	0.100	2.500

Variables	**Model 1: Key predictors + Compositional factors**					**Model 2: Key predictors + Compositional + Contextual factors**					**Model 2: Key predictors + Compositional + Contextual + Working conditions**				
Economic conditions (Poor)															
Good											0.678	0.151	0.156	0.367	1.176

Even when contextual variables were taken into account, the core variables in model 2 were still able to predict suffering from health problems related to work. In this instance, miners in the LSM production and non-production sectors were 77% *and* 74% less likely, respectively, to experience occupational health difficulties than their counterparts in the ASM production sector. In terms of the compositional elements, it was evident that the likelihood of experiencing health problems associated with one's profession was consistently predicted by age, gender, and marital status. Female miners were 1.567 times more likely than their male colleagues to experience health problems associated with their line of work. Similarly, married gold miners were 1.6605 times more likely to experience work-related health problems than single miners. Goldminers who were between the ages of $24\ and\ 33\ (OR = 1.567, p < 0.05)\ and\ 33\ and\ 53\ (OR = 1.567, p < 0.05)$ had higher rates of occupational health problems than their peers who were between the ages of $17\ and\ 23$. Education and experience didn't seem to be statistically significant factors. Of the contextual factors, goldminers with shift-based schedules and those who lived close to mine sites were more likely to experience occupational health issues ($1.678\ and\ 1.674$ times, respectively). Medical exam results and the number of years spent in the mining community were not statistically significant factors.

Even after adjusting for working conditions, Ghanaian goldminers reported having occupational health problems in both the LSM production and non-production sectors in model 3. However, a new relationship surfaced, indicating that the components related to working conditions were mediating. In this case, ASM non-production became statistically significant in predicting the presence of health problems related to one's job. This clearly showed how prepared the miner's department and subsector were to predict the likelihood of health problems related to their line of work.

Gender, marital status, and age were still statistically significant compositional factors in predicting having occupational health issues, just like in models 1 and 2. Here, female miners had a 1.4567 -fold increased risk of occupational health problems compared to their male colleagues. Similarly, married gold miners were 1.7054 times more likely to experience work-related health problems than single miners. Goldminers who were between the ages of $24\ and\ 33\ (OR = 1.757, p < 0.05)\ and\ 34\ and\ 53\ (OR = 1.852, p < 0.05)$ were more likely to experience occupational health issues than their peers between the ages of $17\ and\ 23$.

As with model 2, the contextual factors of shift and proximity were found to be statistically significant in predicting the occurrence of occupational health issues. It was observed that shift workers and those who resided close to mining sites had, respectively, $1.852\ and\ 1.561$ times higher odds of occupational health problems.

Regarding working conditions, gold miners who claimed excellent health were 45.5% less likely than those who reported poor health to experience occupational health problems. Goldminers who claimed good safety conditions were 2.999 times more likely to experience health difficulties related to their jobs than their peers who reported poor safety circumstances. Environmental and economic factors did not significantly predict the results.

Simple random and intentional sampling techniques were employed in the study, along with a descriptive research plan that concentrated on ASGM operating operations and on-site field observation. The internet, journals, and periodicals were employed as secondary data sources. We contacted ASGM operators who agreed to take part in the study. For the study, questions were asked of a total of 510 people. 504 participants for the study were chosen using simple random sampling, and ten (10) officers, including two (2) each from the Environmental Protection Agency, Minerals Commission, Forestry Commission, Water Resources Commission, and Asutifi North District Assembly, were chosen using purposeful sampling. The study used field surveys and key informant interviews to collect data from key informants and artisanal small-scale miners. The Environmental Protection Agency, the Minerals Commission, the Forestry Commission, the Water Resources Commission, and the Asutifi North District Assembly officials were interviewed as key informants using semi-structured questionnaires. Through deliberate sampling, the key informants' respondents were selected. Key informant interviews were carried out to gain additional knowledge of the perceived effects of artisanal and small-scale gold mining as well as the functions performed by these specific regulatory authorities in the research area. To determine the challenges miners faced when implementing OSH techniques, this data was acquired. However, the questions in the field survey were primarily concerned with how OSH regulations were being applied as well as common OHS problems related to small-scale mining operations. Primary data from ASGM operational sites were gathered by the study via a survey. The survey was broken down into two sections: (a) demographic information on the respondents; and (b) data on the causes and effects of accidents that occur while ASGM operations are in place. a) OSH improvement techniques and compliance levels; b) operational activities and OSH management systems for the ASGM business in Ghana. The Likert scale (Likert, 1932), which has a range of one (1) to five (5), was used to evaluate the survey replies. According to the scale, 1 stood for strongly agreeing, 2 for agreeing, 3 for neither agreeing nor disagreeing, 4 for disagreeing, and 5 for strongly disagreeing. Options for not at all, Very often, Often, Indifferent, Not often, and often were also available on the Likert scale. Self-administered questionnaires were used by us. The two sets of questions that made up the questionnaires had both closed-ended and open-ended inquiries. For the closed-ended questions, respondents had to choose from a variety of answers the one that best expressed their ideas. However, there were no more options for the open-ended questions. Responses from respondents were recorded or entirely expressed in writing. Respondents had enough time to carefully consider the questions before responding, ensuring that they gave truthful answers and answered questions as they understood them. Prior to beginning the whole question-asking process, pretesting was done to ensure the questionnaires were correct. The interview guides and questionnaires were serially numbered to ensure the correctness and comprehensiveness of the data collected. Respondents have the freedom to withhold information because their confidentiality and privacy were guaranteed.

V. CONCLUSIONS

In this part, we discuss about the results of our own research on the map of the literature dealing with the meaning of work, we point out where it contributes practically and how it is beneficial to improve the economy, balancing safety and environmental sustainability of Ghana gold mining industry. Our research work is based on theoretical and empirical study. When studying the meaning and meaningfulness of work; this is thus a new approach. Through the examination of theoretical and empirical study, we are able to highlight several unique characteristics of the meaningfulness and meaning of work, and of the change of work meaning, which no other study had managed to identify before. Our study's objective is to investigate the Occupational Safety and Health (OSH) practices employed in Ghana's precious metals mines in order to inform significant stakeholders and authorities. As a whole, what was found provide an in-depth overview of people's welfare problems in Ghanaian gold prospecting settlements. In our study we employed a statistical approach for sampling all 110 survey respondents. By doing a case study, we use regression and descriptive statistics to examine the relationships between the variables in order to determine the tactics employed to strike a balance between security, financial success, and environmental sustainability. As our research revealed absence of OSH oversight of systems, with mechanical, physical, chemical, biological, auditory, ergonomic, and mental risk factors constituting the majority of causes of crashes. This causes injuries, fatalities, and absences from the workplace. Additionally, there were no references for our study's lack of OSH rules and procedures for bettering precious metals extraction. In dissertation, we also address the manner in which we govern the precious metals extraction project as it alters landscape, as well as the economic success and ecological responsibility of Ghana. These findings show that violations of occupational safety and health do occur in the gold mining sector in the research area. Consequently, the investigation recommends striking a balance between protection, monetary success, and sustainable development. A greater prevalence of protective clothing as well as routine incorporation of aerial photography into governmental evaluations of gold extraction operations are all attainable objectives for achieving requirements for workplace health and safety, boosting Ghana's economic output, and ensuring the longevity of the environment.

The significance of our research work is that the results of analysis might add to corpus of knowledge concerning emerging markets and the incorporation of sophisticated methods for mining for natural assets. Investigation focused on the lack of knowledge among executives in Ghana's gold mining industry on the interactions between social responsibility as a corporate entity and the role of trustee to investors. Providing to the hypothesis of social exchange by means of business social responsibility, encompassing duty of care to participants, environmental impact, and interactions with community across minerals sector, was a further significant component of this research work. Relating those procedures to trustee duty could contribute to consolidating the framework by demonstrating the manner in which social accountability may transform into a mutually beneficial arrangement for an enterprise, as opposed to a disadvantage. Whereas, the scope of our dissertation based on Economic impact of the evaluation that looks at how mining has affected Ghana's economic development, employment rates, and tax receipts. It examines the mining industry's connections to other economic sectors as well as how much it contributes to the nation's GDP. It looks at the function of benefit-sharing methods, community involvement, and stakeholder engagement in addressing social issues related to mining. The government revenue and fiscal management review assesses the contribution of Ghana's mining industry to the country's tax, royal, and dividend receipts. It examines the difficulties and possibilities associated with budgetary management and the fair distribution of mining revenues.

So, at the end we recommend the review concludes with suggestions for fostering sustainable growth in Ghana's mining industry. It emphasizes the significance of striking a balance between economic growth, environmental sustainability, and social well-being, and avoids getting too particular about individual mining projects or firms in favor of concentrating on the industry's overall effects on the Ghanaian economy. The implementation of the latest cutting-edge approach should be made a policy they are as follows. The greatest environmental dangers are associated with conventional mining methods like open pit and underground mining. These practices should be banned and enforced. Mining waste reuse. Setting up other industries for the use of mining waste. This can help recycle mining waste and help make the environment safe and friendly. Eco-friendly machinery. Cleaning up Old Mines. Eliminating Illegal Mining. Always Wear Safety Equipment. Get Professional Training Follow the Latest Safety Standards. All these recommendations will work when Government sets out a stringent policy that will guide and regulate the whole mining industry of Ghana

Finally, we conclude that the findings of our study as Gold mining industry in Ghana, which is rapidly expanding and widely practiced throughout Sub-Saharan Africa, is an important source of earnings for a large number of people in the regions where it is conducted. Nevertheless, regardless this acknowledged prospective, the extraction of gold presents a number of challenges to the individuals whose partake in it, with the well-being and security of laborers being especially important. Our investigation's goal is to look at the Occupational Safety and Health (OSH) policies in Ghana's gold mining sector and reveal any flaws so that important stakeholders and authorities are aware. The overall findings of this study offer a thorough grasp of the health issues in Ghanaian gold mining villages. Our research field employed a statistical approach for sampling all 110 survey respondents and revealed the absence of OSH system oversight, with mechanical, physical, chemical, biological, auditory, ergonomic, and psychological hazards constituting the majority of accident causes. This results in harm, deaths, and productive absences. In addition, the research revealed a lack of OSH policies and methods for improving in gold extraction, for which it found not a reference. In our dissertation, we additionally deal with the way we govern the gold extraction process as it alters the countryside, as well as the economic viability and ecological conservation of Ghana. These results indicate that there have been occupational safety and health breaches in the gold rushes in the research region. Consequently, the investigation recommends striking a balance between protection, economic success, and preservation of the environment. A greater prevalence of protective clothing and footwear as well as periodic incorporation of aerial vehicles into governmental evaluations of the gold extraction industry are among the conceivable objectives for achieving occupational safety and health standards, boosting Ghana's financial health and ensuring ecological sustainability.

REFERENCES

[1] Steve Ameyibor, Gold Mining and Land Management in Ghana, http://www.raumplanung.unidortmund.de/geo/download/Abstract%20Vertiefungsentwurf%20Steve%20Ameyibor.pdf (last visited Aug. 12, 2007).

[2] Thomas M Akabzaa, Boon and Dislocation: The Environmental and Social Impacts of Mining in the Wassa West District of Ghana 8 (2000).

[3] Mining Portal of Ghana, The History of Mining in Ghana, http://www.ghana-mining.org/ghweb/en/geologymining/minhistory.html (last visited Aug. 12, 2007).

[4] Thomas Akabzaa & Abdulai Darimani, Impact of Mining Sector Investment in Ghana; A Study of the Tarkwa Region 7 (Natural resources and Sustainable Development Forum-UNCTAD, 2001), http://www.natural-resources.org/minerals/africa/docs/pdfs/Impact%20of%20Mining%20Sector%20Investment%20in%20Ghana.pdf.

[5] Mining Portal of Ghana, Companies with Mining Lease 2001, http://www.mincomgh.org/mining-in-ghana/companies with mining leases.htm (last visited Dec. 21, 2006).

[6] Ghana - Mining: Gold Mining - Overview, http://www.mbendi.co.za/indy/ming/gold/af/gh/p0005.htm (last visited Aug. 12, 2007).

[7] Mining companies such as Ashanti Goldfields merged with AngloGold to form the AngloGold Ashanti.Ghanaian Australian Gold Fields which had in 1997 merged with Ashanti Goldfields became AngloGold Ashanti Iduaprim Mines. Also, Bonte Goldmine, a subsidiary of Akokerri Goldmine a Canadian based mining company, folded up. This period also saw the entry of Newmont Gold mines into the mining sector of Ghana as Newmont GhanaLtd, with its operational areas in the BrongAhafo and the Ashanti Regions of Ghana. http://www.adrbny.com/files/AC4561.pdfhttp://www.anglog

old.com/Investor+Info/Corporate+Activity/AngloGold+Ashanti+Merger+(2004)/ http://www.newmont.com/en/operations/ghana/ahafo/index.asp

[8] Mining Portal of Ghana, Mineral Policy and Fiscal Regime, http://www.ghana-mining.org/ghweb/en/ma/mincom/mcminingnews.html (last visited Aug. 12, 2007).

[9] Dominic Ayine, *The Human Rights Dimension to Corporate Mining in Ghana: The Case of Tarkwa District*, *in* MINING, DEVELOPMENT AND SOCIAL CONFLICTS IN AFRICA 85 (Third World Network-Africa, 2001).

[10] Ghana: Mining – Overview, http://www.mbendi.co.za/indy/ming/af/gh/p0005.htm (last visited Aug. 12, 2007).

[11] Joyce Aryee, Mining as an Agent of Development: The Role of the Industry, Address at the Corporate Responsibility in Ghana: Extending the Frontiers of Sustainable Development Conference (Sept. 2-4, 2004), available at http://www.ghanamining.org/ghweb/en/home/mainStageParagraphs/0/childParagraphs/04/document/National%20Mining%20Conference.pdf.

[12] Adei D, Addei I, and kwadjosse A. H ,(2011).a study of the effects of mining activities on the health status of people: A Case Study .Research Journal of Applied Sciences, Engineering and Technology.3(2):99-104. Akwatia-Wikipedia, the free encyclopaedia also available athttp://en.wikipedia.org/wiki/Akwatia (2007-01-15)

[13] Bell, J.Doing Your Research Project: Open University Press, Buckingham, 3rd edition (august 1, 1999)

[14] Boivin, Y. A free Response Approach to the Measurement of Brand Perceptions. International Journal of Research in Marketing, volume 3, issue 1, pages 11-17, Elsevier ltd, 1986.Also available at http://www.sciencedirect.com/science/article/pii/016781168690039X

[15] Burns, R.B. (2000), Introduction to Research Methods. Sage Publications Ltd; 4th edition Bush, R. F. and Burns, A.C.Basic Marketing Research, Prentice –Hall, 2nd edition (2007) Cambridge dictionary, available at [http://dictionary.cambridge.org/dictionary/british/awareness]

[16] Creswell, J.W. Research Design: Qualitative, Quantitative and Mixed Methods Approaches, 3rd Ed.Sage Publications. July 15th 2008. Daily graphic, (2011) eastern floods, national catastrophe- minister 25th July, 2011, 03:52:32.available at http://www.graphic.com.gh/dailygraphic/page.php?news=14386.

[17] Denzin, N.K., Lincoln, Y.S. (2005). The Sage Handbook of Qualitative Research. Third edition. Sage Publications, London; New Delhi

[18] Furniss, C (2005).Seizing the Moment: The Great Apes Survival Project. Africa Geographic, July issues: 41-51.

[19] Abbasi, S., 2018. Defining safety hazards & risks in mining industry: a case-study in United States. Asian J. Appl. Sci. Technol.(AJAST) 2, 1071–1078.

[20] Abdulai, A.G., 2017. The galamsey menace in Ghana: a political problem requiring political solutions. Policy Br vol. 5.

[21] Agariga, F., Abugre, S., Appiah, M., 2021. Spatio-temporal changes in land use and forest cover in the Asutifi North District of Ahafo Region of Ghana,(1986–2020). Environ. Challenges, 100209.

[22] Amoah, N., Stemn, E., Jan. 2018. Siting a centralised processing centre for artisanal and small-scale mining – a spatial multi-criteria approach. J. Sustain. Min. 17 (4), 215–225. doi:10.1016/j.jsm.2018.10.001.

[23] Amoako, C., Adarkwa, K.K., Koranteng, K.A., 2021. The politics of artisanal small-scale gold mining (ASM) in the AkyemAbuakwa Traditional Area of Ghana. J. Contemp. African Stud. doi:10.1080/02589001.2021.1957791.

[24] Arthur, F., Agyemang-Duah, W., Gyasi, R.M., Yeboah, J.Y., Otieku, E., Jan. 2016. Nexus between artisanal and small-scale gold mining and livelihood in Prestea mining region, Ghana. Geogr. J. 2016, 1–18. doi:10.1155/2016/1605427.

[25] Aryee B.N.A., Ntibery B.K., and Atorkui E., Trends in the small-scale mining of precious minerals in Ghana: a perspective on its environmental impact, 2003.

[26] Asamoah-Gyadu, J.K., 2019. Essays on the Land, Ecotheology, and Traditions in Africa.

[27] Wipf and Stock Publishers. Bansah K., Galecki G., Quaicoe I., Dumakor-Dupey N., Kenneth Joseph B., Grzegorz G., Ishmael Q., and Nelson Kofi D.-D., Occupational health and safety practices in the artisanal and small-scale gold mining sector in Ghana, 2017.

[28] Bansah, K.J., Yalley, A.B., Dumakor-Dupey, N., Jan. 01, 2016. The hazardous nature of small scale underground mining in Ghana. J. Sustain. Min. 15 (1), 8–25. doi:10.1016/j.jsm.2016.04.004, Central Mining Institute in Katowice.

[29] Bansah, K.J., Dumakor-Dupey, N.K., Kansake, B.A., Assan, E., Bekui, P., Nov. 2018. Socioeconomic and environmental assessment of informal artisanal and small-scale mining in Ghana. J. Clean. Prod. 202, 465–475. doi:10.1016/j.jclepro.2018.08.150.

[30] Barreto M.L., Schein P., Hinton J., and F. Hruschka, Economic contributions of artisanal and small-scale mining in Kenya: gold and gemstones, 2018.