BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCES

DEPARTMENT OF ENVIRONMENTAL SCIENCE

AN INVESTIGATION OF KNOWLEDGE ATTITUDES AND PRACTISES ON OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT ISSUES AMONGST ARTISANAL MINERS A CASE STUDY OF BINDURA URBAN

By

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SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF THE BACHELOR OF SCIENCE HONORS DEGREE IN SAFETY HEALTH AND ENVIRONMENTAL MANAGEMENT

DECLARATION

I Joseph NYAMANDI do hereby declare that this research project is my own work and additional sources have been properly and fully acknowledged by means of references. This dissertation has not been submitted before for any degree or examination in any other University. I am responsible for this research and its articulation alone. In no ways do any of the mentioned persons in the acknowledgement bear any direct responsibility for this work.

Students' Signature……. Date ……. /……. /……

APPROVAL FORM

This undergraduate thesis entitled “An investigation of knowledge, attitudes and practices on occupational health and safety management issues amongst artisanal miners, a case study of Bindura urban ”, prepared and submitted by Joseph NYAMANDI in partial fulfilment of the BSc (Hons) Safety Health and Environmental Management, has been examined and recommended for acceptance by Bindura University of Science Education.

Student signature …….. Date…….
Supervisor signature ……. Date……..

DEDICATION

To my beloved wife, Precious, who has been my unwavering support and inspiration who have supported me throughout my academic journey. Your love and encouragement has been a driving force behind my success, and I am forever grateful for your presence in my life. To my family and friends, who have been there for me every step of the way, providing support and motivation when I needed most. I could not have achieved this without your love and support. I dedicate this dissertation to them, with love and appreciation. With deepest gratitude, Joseph NYAMANDI.

ACKNOWLEDGEMENTS

I would like to thank my supervisor, Mr T “Uncaz Ras” Nyamugure, for his guidance and support throughout this project. I am also grateful to my project mentor, Mr F. Mijeri, for his assistance and encouragement. I would also like to thank the staff at Bindura University of Science and Education, the Ministry of Mines, the Bindura City Council, the Ministry of Lands, and the Environmental Management Agency for their cooperation and support during my research. I am grateful for the opportunity to conduct this research and for the guidance and support.

Abstract

This study investigated the demographic characteristics, attitudes, and behaviours of artisanal miners in Bindura urban regarding occupational health and safety management practices. The research aimed to provide insights into the existing safety practices in the artisanal mining sector and identify areas for improvement to enhance the well-being and safety of miners.

A mixed-methods approach was employed to collect data from a sample of artisanal miners in Bindura urban. Surveys and interviews were conducted to examine demographic factors, attitudes towards safety, experiences with safety practices, access to personal protective equipment (PPE), and satisfaction with existing safety measures. The findings revealed a predominantly male workforce in the artisanal mining sector, highlighting the need for gender-inclusive policies and interventions. The miners were primarily young, emphasizing the importance of tailored interventions for addressing the specific needs and challenges faced by this demographic group. Although a significant proportion of miners demonstrated awareness of the importance of occupational health and safety, there were gaps in knowledge and areas that required further attention. The study identified a lack of access to PPE as a critical concern, with a substantial number of participants reporting inadequate protective equipment availability. Furthermore, the study revealed safety lapses and a low level of satisfaction with the then-current safety measures and regulations. These findings underscored the need for enhanced enforcement of safety practices, regular evaluations of safety protocols, and effective communication and engagement with miners to address their concerns and improve overall safety conditions. Several recommendations were provided for improving occupational health and safety management practices in the artisanal mining sector. These recommendations included increasing awareness and education through comprehensive training programs, improving access to proper and effective PPE, strengthening the enforcement of safety practices, revising and updating safety regulations, promoting collaboration and information sharing among stakeholders, establishing support mechanisms such as helplines or counselling services, and conducting regular monitoring and evaluation of safety practices. By implementing these recommendations, it is possible to create a safer and more sustainable working environment for artisanal miners in Bindura urban and similar contexts. These measures will reduce occupational risks, enhance the overall well-being of miners, and contribute to the development of a responsible and socially conscious artisanal mining industry.

Chapter 1.0 INTRODUCTION

1.1 Background to study

Artisanal mining is a prevalent economic activity in Bindura urban, Zimbabwe, contributing significantly to the local economy and livelihoods of many individuals. Artisanal miners engage in small-scale mining operations, often using rudimentary tools and techniques to extract minerals such as gold, diamonds, and tantalite. However, despite its economic significance, artisanal mining is associated with numerous occupational health and safety challenges (Siabi, et. al., 2022).

The artisanal mining sector in Bindura urban operates in an environment characterized by limited regulations, inadequate oversight, and a lack of formalized health and safety management systems. As a result, artisanal miners are exposed to various hazards and risks, including cave-ins, toxic chemical exposure, respiratory diseases, and accidents caused by inadequate safety measures. These occupational hazards not only jeopardize the physical well-being of miners but also have long-term implications for their health and overall quality of life Bansah *et. al.,* (2017).

One of the primary contributing factors to the occupational health and safety challenges in artisanal mining is the lack of knowledge and awareness among miners regarding proper safety practices (Atakora, 2020). Formal training and education programs on occupational health and safety management are often scarce or entirely absent, leaving miners ill-equipped to identify, prevent, and mitigate workplace hazards. Additionally, the availability and utilization of personal protective equipment (PPE) among artisanal miners remain uncertain, further compromising their safety.

Furthermore, attitudes towards occupational health and safety in the artisanal mining sector in Bindura urban have not been thoroughly explored. The prevailing attitudes among miners, including their perception of the importance of safety measures and compliance with regulations, can significantly impact the implementation of effective health and safety practices. Misconceptions, at-risk behaviour and complacency, or a lack of awareness may undermine efforts to prioritize safety within the mining operations.

Given the inherent risks and challenges associated with artisanal mining, it is essential to conduct a comprehensive study on the knowledge, attitudes, and practices of artisanal miners concerning occupational health and safety management issues in Bindura urban. Understanding the existing gaps and barriers will inform the development of targeted interventions, policies, and training programs to improve safety standards, protect the well-being of miners, and promote sustainable mining practices in the region.

1.1 Problem Statement

Artisanal mining plays a significant role in the local economy of Bindura urban, Zimbabwe. According to Singo *et. al*., (2022) the prevalence rate of accidents among artisanal miners was A35%, which is quite alarming. According to media reports, in 2023, a total of 237 people were killed as opposed to 193 in 2022. According to Tsang, et. al., (2019) there is critical need to undertake in-depth research on the risks and hazards faced by artisanal and small scale miners. The increase in deaths could be caused by various factors including the possibility of lack of knowledge or poor attitudes that lead to bad practices. This research seeks to fill that gap.

1.2 Main Objective

An investigation of knowledge attitudes and practises on occupational health and safety management issues amongst artisanal miners a case study of Bindura urban

1.2.1 Specific Objectives

1. To assess the level of knowledge among artisanal miners in Bindura urban regarding occupational health and safety management practices.

2. To examine the attitudes of artisanal miners in Bindura urban towards occupational health and safety in their mining activities.

3. To identify the current practices of artisanal miners in Bindura urban regarding occupational health and safety management.

4. To identify the perceptions of artisanal miners in Bindura urban regarding the adequacy of safety measures and equipment provided in their mining operations.

Research questions

1. What is the level of knowledge among artisanal miners in Bindura urban regarding occupational health and safety management practices?

2. What are the attitudes of artisanal miners in Bindura urban towards occupational health and safety in their mining activities?

3. What are the current practices of artisanal miners in Bindura urban regarding occupational health and safety management?

4. What are the perceptions of artisanal miners in Bindura urban regarding the adequacy of safety measures and equipment provided in their mining operations?

1.3 Justification

Artisanal mining plays a significant role in the economy and livelihoods of individuals in Bindura urban, Zimbabwe. However, the sector faces numerous occupational health and safety challenges that jeopardize the well-being of miners. Therefore, conducting a case study on the knowledge, attitudes, and practices of artisanal miners regarding occupational health and safety management in Bindura urban is of utmost importance for several compelling reasons.

Firstly, the study aims to generate information that can help to protect the health and safety of artisanal miners. Artisanal mining operations are fraught with hazards and risks such as cave-ins, toxic chemical exposure, and accidents due to inadequate safety measures. By assessing the miners' knowledge, attitudes, and practices, the study can identify existing gaps and develop targeted interventions to enhance safety standards, reduce risks, and safeguard the well-being of individuals engaged in this sector.

Secondly, the study addresses the regulatory gap in artisanal mining. Existing mining regulations in Zimbabwe primarily focus on large-scale operations, leaving artisanal miners in a regulatory grey area. Consequently, there is a lack of enforcement and monitoring of occupational health and safety practices. By examining the knowledge, attitudes, and practices of miners in Bindura urban, the study can shed light on the current state of occupational health and safety and provide insights for regulatory reforms and improved enforcement mechanisms.

Thirdly, the study can generate information that can be used to contribute to enhancing productivity and sustainability in artisanal mining. Occupational health and safety management

not only protect miners but also lead to improved productivity and sustainable mining practices. By identifying knowledge gaps and inadequate practices, the study can design interventions to enhance safety measures, reduce accidents and injuries, and promote sustainable mining practices in Bindura urban. This will not only benefit the miners but also contribute to the long-term viability of the mining sector.

Fourthly, the findings of the study will inform training and awareness programs. Many artisanal miners lack access to formalized training on occupational health and safety management, relying on traditional knowledge and informal learning. By understanding the specific knowledge gaps and attitudes towards safety, targeted training programs can be developed to enhance awareness, promote proper practices, and empower miners with the necessary knowledge and skills to protect themselves and their colleagues.

Lastly, the study will contribute to the existing body of knowledge. There is a dearth of research specifically focused on occupational health and safety management among artisanal miners in Bindura urban. By conducting this case study, the study will provide empirical evidence and insights into the unique challenges and dynamics within the local context. The findings will contribute to the existing knowledge on artisanal mining and serve as a foundation for future research and policy initiatives in artisanal mining communities.

In conclusion, the case study on knowledge, attitudes, and practices regarding occupational health and safety management among artisanal miners in Bindura urban is justified to protect miners' health and safety, address regulatory gaps, enhance productivity and sustainability, inform training programs, and contribute to the existing body of knowledge. The study's findings will guide interventions, regulatory reforms, and capacity-building initiatives, ultimately leading to improved well-being, safer working conditions, and sustainable mining practices in Bindura urban.

1.5 Limitation of the study

One limitation of the study is the potential for a small and non-representative sample size, which may limit the generalizability of the findings to the broader population of artisanal miners in Bindura urban. Additionally, reliance on self-reported data may introduce response and recall biases, impacting the accuracy of participants' knowledge, attitudes, and practices related to occupational health and safety. The study may also face challenges in accessing artisanal mining sites, leading to limitations in directly observing and assessing actual practices and working conditions. Lastly, time and resource constraints may restrict the depth and scope

of the study, potentially limiting the exploration of certain aspects of occupational health and safety management.

1.6 Chapter Summary

This chapter highlights the importance of studying knowledge, attitudes, and practices related to occupational health and safety management among artisanal miners in Bindura urban. The justification for the study is presented, emphasizing the need to protect miners' health and safety, address research gaps, inform policy frameworks, improve training initiatives, and contribute to sustainable development. The research hypothesis is formulated, proposing a significant relationship between miners' knowledge, attitudes, and practices and occupational health and safety management. However, the study is not without limitations. These limitations include sample size and representativeness, self-reporting bias, recall bias, limited access to mining sites, and time and resource constraints. Acknowledging these limitations is necessary for interpreting the findings accurately and understanding the potential scope of generalizability. Despite these limitations, the study aims to provide valuable insights into the knowledge, attitudes, and practices of artisanal miners, contributing to the existing body of knowledge and guiding future research and interventions in this field.

Chapter 2 Literature Review

2.0 Introduction

Artisinal gold mining contributes between 20 and 30% of global gold output and the sector also employ over a hundred million people. Thus artisanal gold miners contributes to economic growth in terms of GDP in many countries. Whilst artisanal gold mining benefits a nation to improve economic growth, the sector faces many challenges in terms of environmental degradation and concerns over the safety and health to the concerned miners Siabi, et. al., 2022). According to reports, in Zimbabwe, 237 people were killed in artisanal mining in 2023, which is a big increase from 139 people killed in 2022. The increase in death can be caused by lack of knowledge and poor attitudes which give rise to bad practice. Thus it is important in efforts to arrest and reverse this trend to study the artisanal gold miners' knowledge, attitudes and practices toward health, safety and the environment. This will help in coming up with appropriate interventions supported by scientific facts.

Artisanal Miners knowledge towards hazards and risks in their workplace.

Artisanal mining is a prevalent activity in many developing countries, including Bindura urban in Zimbabwe. These miners face numerous occupational health and safety challenges due to hazardous working conditions, lack of formal regulations, and limited access to resources and information (Spiegel & Veiga, 2010). Consequently, there is an urgent need to assess the level of knowledge among artisanal miners to identify gaps and develop effective interventions.

Several studies have examined the knowledge of artisanal miners regarding occupational health and safety management practices. A study by Musingwini and Sibanda (2017) conducted in Zimbabwe found that artisanal miners had limited knowledge about OHS regulations and preventive measures. Similarly, a survey conducted by Hilson and Okoh (2018) in Ghana revealed that artisanal miners had inadequate knowledge about safety practices, including the proper use of personal protective equipment (PPE).

Access to information and training programs significantly affects the level of knowledge among artisanal miners. In a study by Wilson et al. (2016) in Mali, it was observed that artisanal miners who had received formal training on OHS had a higher level of knowledge and were more likely to adopt safe practices. Similarly, a study by Kapeke (2018) in Tanzania found that artisanal miners with access to information from government agencies and non-governmental organizations demonstrated better knowledge of OHS regulations and practices.

The dissemination of OHS information and knowledge through social networks and peer learning has also been identified as an important factor. A study by Tomic et al. (2019) in the Democratic Republic of Congo found that artisanal miners relied on informal networks and peer interactions to share information about hazards and safety practices. These networks played a crucial role in enhancing their knowledge and promoting the adoption of safe practices.

It is essential to recognize that knowledge alone does not guarantee the implementation of safe practices. Attitudes and perceptions towards occupational health and safety also play a significant role in shaping behavior. Hentschel et al. (2017) highlighted that artisanal miners' attitudes towards safety were influenced by perceived risks, perceived benefits, and social norms. Artisanal miners who perceived higher risks were more likely to adopt safety measures.

To improve knowledge and promote safe practices among artisanal miners, interventions should consider the factors that influence their knowledge, attitudes, and practices. For instance, educational programs tailored to the specific needs of artisanal miners, such as language and cultural considerations, can enhance their knowledge (Musingwini & Sibanda, 2017). Additionally, providing access to information through government agencies, NGOs, and peer networks can help improve knowledge dissemination (Kapeke, 2018; Tomic et al., 2019).

A study into Knowledge, attitudes and Practices of artisanal miners towards OHS issues, Moyo, et.al., (2023) revealed that the majority of the respondents were aware that tuberculosis was a curable disease and that they were more vulnerable to it. However, they were not alert to the fact that HIV increases the risk of contracting TB. Furthermore, only 59% were aware that silica dust can cause permanent lung illnesses.

In a KAP study on artisanal miners knowledge towards risks in the workplace, the majority were aware that they were highly exposed to TB as well as that TB can be cured. However, they were not aware that HIV is a predisposing factor for tuberculosis. The same study revealed that only 59% that exposure to silica dust can result in lung fibrosis. According to Atakora, (2020) the majority (>60%) of the miners in Ghana had very low knowledge about OHS regulations. The most commonly mentioned diseases were lung disease, noise induced hearing loss and infection of the eyes. Demographic factors that influenced knowledge on occupational health issues were education level, and working experience. Workers with low education status and working experience had lower knowledge about occupational health and

safety issues. However in another study in Ghana by Armah, et. al, (2016) it was revealed that artisanal gold miners who were educated were less knowledgeable about the environmental and health impacts of mining compared with their educated counterparts. Again, artisanal miners who were still employed were less likely to know the environmental and health effects of mining compared to those who were no longer working. Furthermore, being female entailed having lesser knowledge about the environmental and health effects of artisanal mining compared to being male.

Artisanal miners' knowledge about occupational health and safety issues can be affected by whether the operator is certified or not. In a study in Congo it was revealed that lower or wrong knowledge was rampant among those miners whose operations were not certified. The study recommended that there is need to enforce regulations so that artisanal mining can only be done by trained people who are aware about the environmental and health risks of artisanal gold mining. With regard to the influence of age on knowledge about occupational health and safety risks and hazards, miners who were in the age class 18 to 24 years were more likely to have less knowledge than those in the 25 to 34 years. However, there was no significant difference in knowledge between those in the 18 to 24 years and those who are above 35 years of age. The same study also noted that those workers who perceived their occupational environment safer, did not have much knowledge about the risks of mining on environmental and human health impacts of mining.

Artisanal miners' attitudes towards hazards and risks

In a study in Ghana revealed that most artisanal miners did not use PPE because they perceive it to be of less importance. The particularly had negative attitudes towards the use of helmets and gloves.In Burkina Faso, in a study of knowledge about occupational hazards and risks among artisanal farmers, Sana, *et. al.,* (2017) concluded that the majority of miners (51%) were not aware of the environmental and health effects of artisanal mining. Knowledge was most prevalent among those who had more than 3 years working experience. The perception of health and environmental effects of gold mining was significantly associated with the position occupied by the respondent. In a study into Knowledge, attitudes and Practices of artisanal miners towards OHS issues in Zimbabwe, Moyo, *et.al.,* (2023) revealed that the majority of the respondents revealed a positive attitudes concerning health care if they were sick. Furthermore the majority of respondents were willing to use respirators to prevent the inhalation of dust particles. In another study on information seeking behaviour of artisanal miners, it was revealed that the majority (95%) of them had a positive attitude towards

information seeking and the majority of them (84%) had invested in information seeking systems. This positive attitude was found to be related to levels of education, marital status and being a full time worker.. Workers who work full time, are married and those who were more educated had more positive compared to their counterparts (Nwagu and Igwe, 2015).

Although artisanal mining is perceived as imposing harmful environmental and health impacts, a study by Quarm, *et. al.,* (2022) unravelled that most people prefer it to continue as it is a very vital source of livelihoods especially given the reality that formal employment is now hard to acquire. However, a study by Brunnschweiler, et. al., (2024) revealed that whilst artisanal miners are against a ban of its activities, non-artisanal miners are supportive of the ban because of the adverse environmental and health impacts associated with its activities.

Artisanal miners' practices towards hazards and risks

In Ghana, Mensah, et. al., (2022) found out that the majority 62%) of miners did not make use of PPE. Among those who used PPE, only boots were worn at the expense of other PPE such as gloves, head protection helmets and machine guards. Aram, *et. al.,* (2021) also revealed that the majority of miners (74%) used personal protected equipment. This use of PPE was however more prevalent among the more educated miners compared to those with less education. Furthermore, this use of PPE was more prevalent among workers in non-productive department compared to those in production departments. Again the use of PPE was less among women and among people who earned more income. Another study in Ghana by Bansah *et. al.,* (2017) revealed that the majority of workers in artisanal mining in the study area had poor Occupational health and safety practices that culminated in many deaths and injuries. In a study on knowledge of artisanal gold miners and risks posed by mercury in the mining process, Armah, *et. al.,* (2016) revealed that the majority of miners had very low knowledge about the harmful health and environmental effects of mercury. There was a significant relationship between knowledge and sex where by being female entailed 68% lesser knowledge compared to males. Furthermore, those miners who had previously met the negative effects of mercury on the environment and health were 4.86 more likely to know the deleterious effects of mercury on the environment and human health.

In Ghana, Mensah, *et. al.,* (2022) discovered that poor OHS practice may arise from lack of an OHS management system in spite of there being an OHS policy. This indicates lack of conformance as a result of non-enforcement of OHS management system guidelines. The study recommended occupational health and safety training programs among artisanal gold miners.

In Zimbabwe, Singo, *et. al*. (2022), discovered that whilst miners were exposed to chemical pollution and poor ventilation, the application of the hierarchy of controls was inadequate in a study among artisanal miners. This is because in some cases, miners may have the knowledge about what do concerning occupational health and safety but they fail to implement processes and procedures to improve workplace safety because of shortage of resources. Another weakness in terms of occupational health and safety promotion was revealed to be a lack of an artisanal and small scale mining policy framework to regulate occupational risks and hazards.

In a study by Ajith, *et. al.,* (2020) employees had a negative attitude about the commitment of management about the mitigation of occupational health and safety hazards and risks and this often leads to bad practices that can worsen work place safety and health.

Occupational Health and Safety (OHS) management

Occupational Health and Safety (OHS) management is a critical aspect of the mining sector, given the inherent risks and hazards associated with mining operations. The primary objective

of OHS management is to systematically and cohesively address workplace hazards and risks, thereby ensuring the health, safety, and well-being of workers. By implementing comprehensive policies, procedures, and practices, OHS management aims to prevent accidents, injuries, and illnesses, while promoting a safe and healthy work environment.

Worker safety is of utmost importance in the mining sector. Mining operations involve working in challenging environments with heavy machinery, explosives, and exposure to various hazards. OHS management plays a crucial role in mitigating these risks and safeguarding the lives of workers. Through the implementation of appropriate safety measures, such as proper training, the use of personal protective equipment, and regular equipment inspections, OHS management strives to prevent accidents and injuries, creating a secure working environment for miners.

In addition to worker safety, OHS management also focuses on protecting the long-term health of miners. Mining operations often expose workers to various health risks, including respiratory diseases, musculoskeletal disorders, hearing loss, and occupational diseases caused by exposure to toxic substances. OHS management identifies and controls these health hazards through measures like ventilation systems, dust control protocols, monitoring of exposure levels, and the implementation of safe handling practices. By addressing these risks proactively, OHS management ensures the well-being and long-term health of miners.

OHS management is essential for mining companies to comply with legal requirements and regulations. The mining sector is subject to stringent laws and regulations related to worker safety and health. OHS management systems ensure that mining companies meet these obligations, preventing legal and financial liabilities. By adhering to industry standards and best practices, companies can demonstrate their commitment to worker safety and health, fostering a positive reputation and compliance with legal frameworks.

A safe and healthy work environment significantly contributes to increased productivity and operational efficiency in the mining sector. When workers feel safe and protected, they can focus on their tasks with confidence, leading to improved productivity and reduced downtime. OHS management systems provide the necessary framework to identify and mitigate potential hazards, ensuring smooth operations and minimizing disruptions. By investing in robust OHS management, mining companies can enhance overall operational effectiveness and achieve higher levels of productivity.

Furthermore, OHS management is closely tied to the reputation and sustainability of mining companies. Mining operations that prioritize worker safety and health establish themselves as responsible corporate entities. By implementing comprehensive OHS management systems, companies showcase their commitment to the well-being of their workforce and the communities in which they operate. This enhances their reputation within the industry and among stakeholders, contributing to long-term sustainability and social responsibility.

Finally, effective OHS management can result in cost savings for mining companies. By preventing accidents and injuries, companies can avoid the financial burdens associated with medical expenses, compensation claims, equipment damage, and production disruptions. Investing in OHS management is a proactive approach that can yield significant cost savings in the long run, while also ensuring the well-being of workers and the financial stability of the mining operations.

Challenges and barriers to effective OHS management in artisanal mining.

Effective occupational health and safety (OHS) management in artisanal mining faces numerous challenges and barriers due to the unique characteristics and operating conditions of this sector. One significant challenge is the informality and lack of regulation that often surround artisanal mining activities. These operations typically operate outside formal legal frameworks and government oversight, making it difficult to enforce OHS regulations and standards. The absence of clear guidelines and inspections contributes to inadequate safety measures and practices in artisanal mining.

Limited access to resources and infrastructure is another challenge faced by artisanal miners. They often lack the necessary resources and infrastructure for effective OHS management. This includes essential items such as personal protective equipment (PPE), training programs, health services, and proper ventilation systems. The financial constraints and lack of support systems in place hinder the implementation of adequate safety measures, leaving miners vulnerable to occupational hazards.

A significant barrier to effective OHS management in artisanal mining is the limited awareness and knowledge about occupational hazards and safety practices. Many artisanal miners are not fully aware of the potential risks associated with their work, the importance of safety measures,

or the proper procedures to mitigate hazards. Insufficient education and training programs contribute to this knowledge gap, making it challenging to establish a culture of safety and implement effective OHS practices.

The hazardous working environment in artisanal mining poses a considerable challenge to OHS management. Artisanal miners often work in dangerous conditions, such as unstable tunnels, inadequate support structures, and exposure to toxic substances like mercury and lead. The use of rudimentary tools and equipment further increases the risk of accidents, injuries, and occupational illnesses. Working in such challenging environments makes it more difficult to implement and maintain effective OHS practices.

The lack of enforcement and inspection mechanisms is another barrier to effective OHS management in artisanal mining. In many regions, the enforcement of OHS regulations in these operations is weak or non-existent. Limited government capacity and resources contribute to the lack of inspections and enforcement, allowing unsafe practices to persist without consequences. The absence of regulatory oversight undermines efforts to improve OHS conditions in artisanal mining.

Socio-economic pressures also hinder effective OHS management in artisanal mining. Artisanal miners often face poverty, lack of alternative livelihoods, and economic instability. These socio-economic pressures can lead to a focus on immediate economic gains rather than investing in OHS measures. Miners may prioritize productivity and output over safety precautions due to financial constraints and the need to meet basic survival needs.

The unstable organizational structures commonly found in artisanal mining operations present a significant challenge to OHS management. These operations are often characterized by decentralized and informal organizational structures, with a lack of clear roles and responsibilities. This makes it difficult to establish and maintain effective OHS management systems, as accountability and coordination become challenging.

Lastly, limited access to healthcare services poses a barrier to effective OHS management in artisanal mining. Artisanal miners often lack access to adequate healthcare services, including medical examinations, health monitoring, and treatment for work-related injuries and illnesses. This hampers timely diagnosis, prevention, and management of occupational health issues, further compromising the well-being of the miners.

Addressing these challenges and barriers requires a comprehensive approach involving collaboration between governments, mining associations, non-governmental organizations (NGOs), and local communities. Interventions should focus on raising awareness among artisanal miners, providing training and education on OHS practices, improving access to resources and infrastructure, strengthening regulatory frameworks, and promoting sustainable and responsible mining practices. By addressing these barriers, it is possible to enhance OHS management in artisanal mining and improve the safety and well-being of artisanal miners.

CHAPTER 3: RESEARCH METHDOLOGY

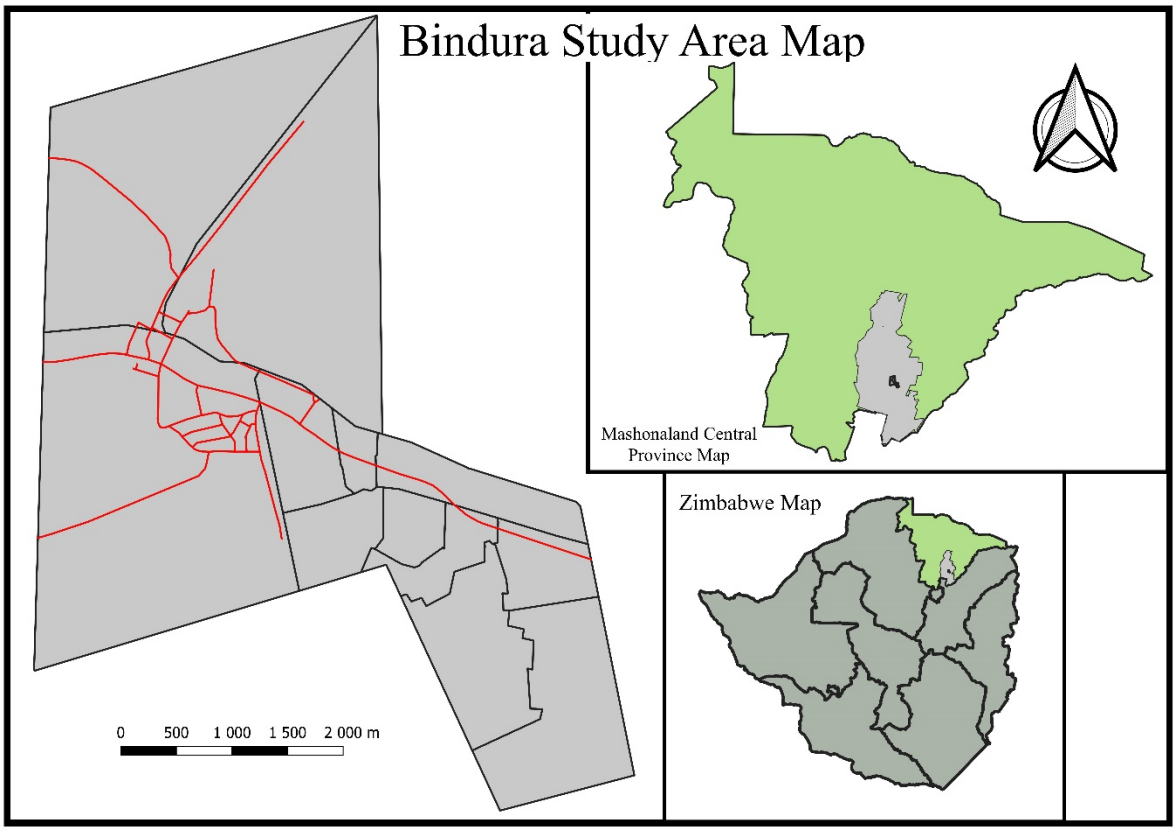
3.0 INTRODUCTION

This section presents an introduction to the research methodology employed in the study titled "An Investigation of Knowledge, Attitudes, and Practices on Occupational Health and Safety Management Issues Amongst Artisanal Miners: A Case Study of Bindura Urban." It outlines the research design, data collection methods, sampling technique, and data analysis approaches used to address the research objectives. Additionally, it discusses the ethical considerations and limitations of the study.

3.1 Location of the Study Area

The study was conducted in Bindura and it is in Mashonaland Central, Zimbabwe, its geographical coordinates are 17° 17' 47" South, 31° 19' 47" East. There are 21 wards in Bindura district in Zimbabwe.

Figure 3.1 Zimbabwe map showing the location of the study area



3.2 Research Design

The study adopted a cross sectional survey design.

3.3 Sampling Technique

The sampling technique chosen for this study is purposive sampling, which involves selecting participants who possess specific characteristics or qualities that are relevant to the research objectives. In this case, the researchers will target individuals from the artisanal mining community in Bindura Urban who have knowledge and experience related to occupational health and safety in artisanal mining.

Purposive sampling is particularly suitable for this study because it allows for the selection of participants who can provide valuable insights into the research topic. By targeting individuals with expertise or direct involvement in artisanal mining activities, the researchers can gather in-depth information about the knowledge, attitudes, and practices of artisanal miners regarding occupational health and safety management issues. These participants are likely to have first-hand experience with the challenges and realities of working in the artisanal mining sector, making their perspectives highly relevant to the study.

The sample size for this study will be determined based on data saturation. Data saturation refers to the point in the data collection process where new information or insights are no longer emerging from the participants. Saturation indicates that the researchers have gathered sufficient data to address the research objectives effectively and that further data collection is unlikely to yield substantially new findings. The sample size will be continuously evaluated throughout the data collection process, and data collection will cease once data saturation is achieved.

While purposive sampling allows for targeted selection of participants, it is important to acknowledge that the sample may not be fully representative of the entire artisanal mining community in Bindura Urban. The findings may be specific to the selected participants and may not be generalized to the larger population. However, the focus of this study is to gain in-depth insights and understand the experiences and perspectives of those directly involved in artisanal mining. The researchers will strive for diversity within the purposive sample to capture a range of perspectives and experiences, enhancing the richness and depth of the findings.

3.4 SAMPLE SIZE

The sample size of respondents was determined by using the Cochran formula below.

$No = (z2 \times p\ (1-p))/e2$

In directive to estimate the appropriate district level sample magnitude for respondents, the study based on the entire population of families in the three districts and using the following formula for calculating the sample size below:

$n = DEFF * (z2 * (p)\ (1-p))\ /d2$

DEFF = Design effect (1.2)

Z value = 1.645 for p = 0.1 or 90% confidence intervals

P = Estimated is not known, so we assume that 50%

q = 1 − p

= 1 − 0 .5

= 0 .5

Therefore, the sample size required was calculated as follow:

$n = DEFF * (z2 * (p)(1-p)) / d2$

$n =0.9*(((\ 1.6452\ )*(0.5)*(0.5))/(0.052))$

n=119.5

n=120

Therefore the number of respondents was to be 120.

RESEARCH TOOLS

The researcher manually distributed the questionnaires to the target population within the artisanal mining community in Bindura Urban, specifically selecting individuals who were involved in artisanal mining activities. The researcher ensured that participants were given ample time to complete the questionnaires and patiently waited for their responses.

The questionnaire employed in the study was structured into four sections, tailored to address the research objectives:

(i) Demographics: This section aimed to gather information about the participants' background, including age, gender, educational background, and years of experience in artisanal mining in Bindura Urban.

(ii) Knowledge about Occupational Health and Safety Management Issues: This section focused on assessing the participants' knowledge regarding occupational health and safety management issues in the context of artisanal mining. The questions were designed to evaluate their understanding of the potential hazards, safety protocols, and risk management practices.

(iii) Attitudes towards Occupational Health and Safety Management Issues: This section aimed to explore the participants' attitudes and perceptions towards occupational health and safety management. It included questions that allowed participants to express their opinions, beliefs, and concerns related to safety measures and the importance of adherence to occupational health and safety regulations.

(iv) Practices Related to Occupational Health and Safety Management: This section focused on understanding the actual practices of artisanal miners concerning occupational health and safety management. It aimed to identify the measures they currently implement or their lack thereof in their daily work routines.

Once the participants completed the questionnaires, the researcher collected and further analysed the data. The collected data from the questionnaires were processed and subjected to appropriate statistical techniques or qualitative analysis, depending on the nature of the questions and research objectives.

Reliability and validity of the study

The reliability and validity of a study are crucial aspects to consider when assessing the quality and credibility of the research findings. In the case of the study titled "An Investigation of Knowledge, Attitudes, and Practices on Occupational Health and Safety Management Issues Amongst Artisanal Miners: A Case Study of Bindura Urban," several measures were taken to ensure the reliability and validity of the study.

Reliability refers to the consistency and stability of the research findings. To enhance reliability, the researchers utilized standardized measurement scales and validated questionnaires. These instruments have been previously tested and proven to produce

consistent results when measuring knowledge, attitudes, and practices related to occupational health and safety management. Additionally, the researchers ensured clear and precise instructions were provided to the participants to minimize potential sources of measurement error.

Validity refers to the accuracy and appropriateness of the research findings in measuring what they are intended to measure. In this study, multiple measures were taken to ensure validity. Firstly, the questionnaires and interview protocols were developed based on a thorough review of relevant literature and consultation with experts in the field. This ensured that the research instruments aligned with established theories and concepts related to knowledge, attitudes, and practices of occupational health and safety management. Additionally, the research instruments were piloted with a small sample of participants from the target population to assess their clarity, relevance, and comprehensibility. Feedback from the pilot study was used to refine and improve the instruments, enhancing the validity of the data collected.

Furthermore, the researchers employed a mixed-methods approach, combining both quantitative and qualitative methods. This approach allowed for triangulation, where data from multiple sources were compared and analysed to identify converging or diverging findings. Triangulation enhances the validity of the study by providing a more comprehensive and robust understanding of the research topic.

To establish the internal validity of the study, the researchers employed purposive sampling to select participants who possessed relevant knowledge and experience in artisanal mining and occupational health and safety management. By targeting individuals with expertise in the subject matter, the researchers aimed to capture accurate and representative perspectives.

External validity, which refers to the generalizability of the findings beyond the specific study context, may be limited due to the case study design focused on Bindura Urban. However, the researchers aimed for diversity within the purposive sample to capture a range of perspectives, enhancing the transferability of the findings to similar contexts.

STATISTICAL ANALYSIS

Data were analysed using SPSS to produce frequencies for each KAP question. For each KAP question, a preferred response was assigned a score of 1. A wrong or unpreferred response was assigned a score of zero. The individual scores were used to calculate mean scores for each of Knowledge, attitudes and Practices. The Pearson's chi-square test was used to test for associations between KAP and socio-economic variables.

CHAPTER 4: RESULTS

4.0 INTRODUCTION

This chapter presents the findings of the investigation on knowledge, attitudes, and practices regarding occupational health and safety management among artisanal miners in Bindura urban. The results are based on the data collected through the structured questionnaire, in-depth interviews, and focus group discussions.

4.1 SECTION A: DEMOGRAPHY

Table 2: Summary of demographic characteristics

Demographic	**Category**	**n=120**	**%=100**
Sex	Male	115	95.6
	Female	5	4.3
Age	18-25	21	17.5
	26-35	64	53.5
	36-45	19	15
	46-55	10	8.5
	>56	6	5.5
Highest level of education	Primary	35	30
	Secondary	80	67
	tertiary	5	3
Marital status	Single	10	8
	Divorced	23	20
	Married	70	59
	widowed	17	13
Religion	Christian	117	97.5
	Muslim	3	2.5
	other	0	0

The demographic characteristics of artisanal miners in Bindura urban revealed important insights into the composition of the workforce in this sector. The results indicated a significant gender disparity, with a vast majority (95.6%) of the participants being male. This finding suggested that artisanal mining in Bindura urban was predominantly a male-dominated field, with limited female representation. This gender imbalance highlighted the need for gender-inclusive policies and initiatives to promote equal opportunities for women in artisanal mining.

In terms of age distribution, the results showed that the majority of participants (53.5%) fell within the 26-35 age range, indicating a relatively young workforce. This finding aligned with the general trend observed in many mining communities, where younger individuals often engaged in artisanal mining activities. The presence of a significant number of participants in the 18-25 age range (17.5%) further emphasized the youthfulness of the artisanal mining workforce in Bindura urban.

Regarding education, the findings indicated that the majority of participants had completed secondary education (67%), followed by those with primary education (30%). Only a small percentage (3%) reported having tertiary education. These results suggested that while a substantial portion of artisanal miners in Bindura urban had attained a secondary education level, there was a need for increased access to higher education and vocational training programs to enhance the knowledge and skills of miners in occupational health and safety management.

Marital status among the participants revealed that a significant proportion (59%) were married, while smaller percentages were single (20%), divorced (13%), or widowed (8%). These diverse marital statuses reflected the varied personal circumstances of artisanal miners in Bindura urban. It was important to consider the potential implications of these marital statuses on the well-being and safety of miners, as family responsibilities and support systems could significantly impact their engagement in safe mining practices.

In terms of religious affiliation, the overwhelming majority of participants (97.5%) identified as Christians, while a small percentage (2.5%) identified as Muslims. The absence of participants identifying with other religions suggested a strong Christian influence within the artisanal mining community in Bindura urban. Understanding the religious beliefs and practices of miners was valuable in developing culturally appropriate interventions and communication strategies related to occupational health and safety.

In conclusion, the demographic characteristics of artisanal miners in Bindura urban revealed a predominantly male workforce with a wide age range and varying levels of education. The majority of participants were married and identified as Christians. These demographic insights provided a foundation for understanding the unique perspectives, needs, and challenges of artisanal miners in relation to occupational health and safety management. Addressing the specific demographic factors could help tailor interventions and policies to effectively improve safety and well-being within the artisanal mining sector in Bindura urban.

SECTION 4.2 Knowledge of Occupational Health and Safety Management Practices

Table 4.1 Participants' response to knowledge questions

The participants' level of knowledge are shown in table 4.1 below

Knowledge Variable	Preferred response	n	Percentage	Score
Have you received any training on occupational health and safety management practices	Yes	0	0	0
Do you use any personal protective equipment (ppe) while working?	Yes	4	4	0.04
Are you aware of the potential health hazards associated with artisanal mining activities	Yes	25	21	0.21
Do you often receive medical check-ups or health assessments related to your work as an artisanal miner?	Yes	1	0.01	0.0008
Are you familiar with the emergency procedures in case of accidents or incidents at the mining site?	Yes	1	0.01	0.0008
Total Score				**0.22**
Mean Score				**0.04**

From table 4.1 above, it can be seen that overall knowledge among artisanal miners is very low with a mean score of 0.04 or 40%. This means only 44 % of the miners were knowledgeable about occupational health and safety issues

4.3 ATTITUDES TOWARDS OCCUPATIONAL HEALTH AND SAFETY

The response of artisanal miners are shown in table 4.2 below

Table 4.2 Artisanal miners' responses to attitude questions

Attitude Variable	Preferred response	n	Percentage	Score
Do you consider occupational health and safety important in your mining activities	Yes	80	67	0.67
Do you believe that following proper safety measures can reduce the risks associated with artisanal mining	Yes	97	81	0.81
Do you encounter situations where safety measures are neglected or not followed by artisanal miners	No	6	5	0.05
Have you ever refused to work in a mining area or task due to safety concerns	Yes	112	93	0.93
Are you satisfied with the safety measures and regulations currently in place for artisanal mining activities	Yes	5	4	0.04
Do you believe that increased awareness and training on occupational health and safety can positively impact artisanal mining practices	Yes	1	13	0.13
Total Score				**2.63**
Mean Score				**0.38**

From table 4.2 above, it can be seen that the mean attitude score is very low at 0.38 or 38%. Only 13 % of the miners believed that they could benefit from training programs. On the other hand the majority of the miners (81%) believe that risks associated with artisanal mining can be reduced by following proper safety procedures. Furthermore the majority of the miners reported that they have refused to work in an unsafe place.

CURRENT PRACTICES OF OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

The practices of artisanal miners towards OHS is shown in table 4.3 below

Table 4.3 Artisanal miners' responses to practice questions

Practice Variable	**Preferred response**	**n**	**Percentage**	**Score**
Do you receive any training or information about occupational health and safety management practices	Yes	40	33	0.33
Do you have access to personal protective equipment (ppe) while working	Yes	1	0.83	0.0083
Are there designated safety officers or personnel responsible for enforcing safety measures at the mining site	Yes	0	0	0
Do you conduct risk assessments or hazard identification before starting mining activities?	Yes	112	93	0.93
Are there any safety guidelines or procedures in place at your mining site	Yes	5	13	0.13
Have you experienced any occupational accidents or incidents while working as an artisanal miner	Yes	15	13	0.13
Are there any health and safety regulations or laws specific to artisanal mining that you are aware of?	Yes	1	0.83	0.0083
Total Score				**1.54**
Mean Score				**0.22**

From table 4.3 above it can be seen that practice among artisanal miners towards OHS issues are very poor, with a mean score of 0.22 or 22%. This means only 22% of the miners were doing the right thing with 78% doing the incorrect things. It can also be seen that there are no personnel assigned to oversee safety among the artisanal miners.

CHAPTER 5 DISCUSSION

The majority (95%) of the miners were men with women making up for the remaining 5%. This can be due to the fact that artisanal mining requires the use of too much manual labour that women cannot stand. The other reason could be that women are involved in artisanal mining indirectly by servicing the area through supplying various provisions like food, drink, tobacco and as sex workers (Ofosu, et. al., 2022). However, this finding of there being few women than men contradict claims by MacQuilken and Hilson (2016) that in Ghana, women make up 50% of artisanal miners since there have less opportunities in the formal sector and yet they have to provide livelihoods for their families. In contrast according to Danielsen and Hinton, 2020), women occupy peripheral roles in artisanal mining and are scarcely considered as miners at all because of the miners' syndrome that regards only men as miners.

The findings of this study reveal that artisanal miners in the study area lack knowledge about occupational health and safety with overall knowledge of 4%. This finding agrees with a research by Musingwini and Sibanda (2017) who concluded that artisanal miners lacked knowledge about OHS. Another possible reason why the miners are not knowledgeable is because they are not trained on the hazards and risks prevalent among artisanal miners (Wilson et al. (2016). Thus, it is necessary for artisanal miners to receive some form of trainings. This can be possible if artisanal miners operate within a certain government led regulatory framework. A study by Kapeke (2018) in Tanzania found that artisanal miners with access to information from government agencies and non-governmental organizations demonstrated better knowledge of OHS regulations and practices. According to Atakora, (2020) the majority (>60%) of the miners in Ghana had very low knowledge about OHS regulations. A different study in Ghana by Hilson and Okoh (2018) also discovered that artisanal gold mined lacked knowledge about occupational health and safety issues. In a study in Ghana, Sana, *et. al.*, (2017) concluded that the majority of miners (51%) were not aware of the environmental and health effects of artisanal mining. Knowledge was most prevalent among those who had more than 3 years working experience. From the present study it can be revealed that only 4% of the miners report having had some form of training. Again only 4% of the miners report that they use PPE. This result tallies with research results obtained by Aram. et. al., (2017) who noted that most artisanal miners did not use PPE because they perceive it to be of less importance.

In terms of attitudes, the majority of respondents claimed that they considered that occupational health as important. This is however at variance with actual behaviour on the ground where the majority do not even use PPE. However, this may be because whilst people know the importance of something, they may not adopt it because they may lack in terms of resources to fulfil provision of PPE. According to responses the majority of miners in the present study feel that they work in an environment where safety precautions are neglected. Again this may emanate from the goal of maximising profit at the expense of safety procedures which may be deemed expensive.

In terms of other practice besides PPE use, in the case of having an occupational health and safety guideline, only 13% reported to have it which is quite low. This lack of guideline may be responsible for most of the poor practices by the respondents. According, Mensah, *et. al.*, (2022) in Ghana, poor OHS practice may arise from lack of an OHS management system in spite of there being an OHS policy.

Shortage of resources may inhibit the implementation of good safety practices. In Zimbabwe, according to Singo, *et. al*. (2022), whilst miners were exposed to chemical pollution and poor ventilation, the application of the hierarchy of controls was inadequate in a study among artisanal miners. This is because in some cases, miners may have the knowledge about what do concerning occupational health and safety but they fail to implement processes and procedures to improve workplace safety because of shortage of resources.

5.2 Conclusion

The study concludes that in the study area knowledge about occupational health and safety issues was extremely low, attitudes were very negative and practices very poor. Thus it can also be concluded that artisanal miners are exposed to risks and hazards associated with artisanal mining.

5.3 Recommendations

The research recommends that artisanal miners should be governed by laws that compel them to designate safety officers as one of the conditions for licence renewal. There is also need for awareness trainings about occupational health hazards and risks associated with artisanal miners. The study recommends regulatory control of artisanal mining and the development of safety and health frameworks that guide their operations.

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Accidents, Injuries, and Safety among Artisanal and Small-Scale Gold Miners in Zimbabwe

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Appendix

BINDURA UNIVERSITY OF SCIENCE EDUCATION

An investigation of knowledge attitudes and practises on occupational health and safety management issues amongst artisanal miners a case study of Bindura urban

Household Questionnaire

Good day. Please note that this questionnaire is predestined to gather data to be used for the thesis work as part of a degree in safety health and environmental science. Information gathered shall remain confidential and participation is strictly voluntary.

SECTION A: Demographics and Characterization

Section 1: Demographic Information

Age of miner **21-30** ☐ **30-40** ☐ **40-50** ☐ **above 50** ☐

Gender: **Male** ☐ **Female** ☐

Marital status: **Divorced** ☐ **Married** ☐ **Single** ☐ **Widowed** ☐

Level of education: **Primary** ☐ **Secondary** ☐ **Tertiary** ☐ **Technical** ☐

Religion: **Christianity** ☐ **Muslim** ☐ **Other……**

SECTION B: Knowledge of Occupational Health and Safety Management Practices

1. Have you received any training on occupational health and safety management practices?

Yes ☐ **No** ☐

3. Do you use any personal protective equipment (PPE) while working? Yes ☐ **No** ☐

4. Please select the appropriate options that describe the importance of using personal protective equipment (PPE) in artisanal mining:

To protect against dust and harmful particles ☐

To prevent injuries from falling objects ☐

To safeguard against chemical exposures ☐

To minimize the risk of accidents and injuries ☐

5. Are you aware of the potential health hazards associated with artisanal mining activities?

Yes ☐ **No** ☐

6. How often do you receive medical check-ups or health assessments related to your work as an artisanal miner? Yes ☐ **No** ☐

7. Are you familiar with the emergency procedures in case of accidents or incidents at the mining site? Yes☐ No☐

8. Have you ever witnessed or been involved in an occupational accident or incident at the mining site? Yes☐ No☐

SECTION C ATTITUDES TOWARDS OCCUPATIONAL HEALTH AND SAFETY

1. Do you consider occupational health and safety important in your mining activities?

Yes☐ No☐

2. Do you believe that following proper safety measures can reduce the risks associated with artisanal mining? Yes☐ No☐

3. In your opinion, who is primarily responsible for ensuring occupational health and safety in artisanal mining activities?

Individual miners themselves☐

Mining community or associations☐

Government or regulatory bodies☐

Mining companies (if applicable)☐

Other (please specify): _____

4. Do you encounter situations where safety measures are neglected or not followed by artisanal miners? Yes☐ No☐

5. Have you ever refused to work in a mining area or task due to safety concerns? Yes☐ No☐

7. Are you satisfied with the safety measures and regulations currently in place for artisanal mining activities? Yes☐ No☐

8. Do you believe that increased awareness and training on occupational health and safety can positively impact artisanal mining practices? Yes☐ No☐

SECTION D: CURRENT PRACTICES OF OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

1. Do you receive any training or information about occupational health and safety management practices? Yes☐ No☐

2. Do you have access to personal protective equipment (PPE) while working? Yes☐ No☐

3. Are there designated safety officers or personnel responsible for enforcing safety measures at the mining site? Yes☐ No☐

4. Do you conduct risk assessments or hazard identification before starting mining activities? Yes☐ No☐

5. Are there any safety guidelines or procedures in place at your mining site? Yes☐ No☐

6. How do you communicate safety-related information or warnings among the miners at the site? Verbal communication☐ Written notices or memos☐ Safety meetings or briefings☐

7. Have you experienced any occupational accidents or incidents while working as an artisanal miner? Yes☐ No☐

8. Are there any health and safety regulations or laws specific to artisanal mining that you are aware of? Yes☐ No☐

Section E: Perceptions of Safety Measures and Equipment

1. Would you rate the overall adequacy of safety measures in your mining operations?

Yes☐ No☐

2. Are you provided with the necessary safety equipment for your mining operations?

Yes☐ No☐

3. Do you believe that the safety measures and equipment provided are sufficient to protect you from potential hazards in your mining operations? Yes☐ No☐

4. Have you ever faced situations where the provided safety equipment was insufficient or inadequate for your mining operations? Yes☐ No☐

5. Do you receive proper training on how to use the safety equipment effectively?

Yes ☐ **No** ☐

6. How confident are you in using the safety equipment correctly? Yes ☐ **No** ☐

7. How often do you receive updates or information regarding new safety measures or equipment for artisanal mining? Yes ☐ **No** ☐