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Effectiveness and Implementation Gaps in Safety, Health and Environmental Management Practices: Evidence from Kwacha Milling, Zambia

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Abstract

This study assessed the effectiveness of Safety, Health and Environmental (SHE) management practices at Kwacha Milling Industry in Chipata District, Zambia, with a focus on identifying implementation gaps that may undermine workplace safety. A mixed-methods cross-sectional design was employed, involving 200 employees selected through stratified random sampling. Quantitative data were collected using structured questionnaires and analyzed through descriptive statistics, while qualitative insights were obtained from semi-structured interviews and examined using thematic analysis. The findings revealed that the company has adopted key SHE measures, including the provision of personal protective equipment (PPE), risk assessment, safety training, inspection, and monitoring. PPE, risk assessments, and training were rated as effective by the majority of respondents, demonstrating their contribution to reducing workplace hazards. Conversely,

inspection and monitoring were perceived as less effective, mainly due to inconsistent follow-up, limited supervisory oversight, and resource constraints. Major challenges affecting SHE compliance included inadequate resources (42%), communication barriers (27%), delayed approval of standard operating procedures (17%), and shortages of skilled personnel (15%). Despite these constraints, the implemented SHE measures resulted in improved hazard reporting, better working conditions, and enhanced legal compliance. The study concludes that while SHE systems at Kwacha Milling show progress, significant gaps persist in monitoring, communication, and resource allocation. Strengthening supervision, improving feedback mechanisms, and investing in adequate resources are recommended to enhance occupational safety performance and promote a sustainable safety culture within the organization.

Keywords: Compliance, Health and Environment, Occupational Safety, Risk Management

1. Introduction

Occupational health and safety (OHS) remains a major global public health challenge, with an estimated 2.78 million workers dying each year from work-related injuries and diseases (ILO, 2019) ^[1]. Despite advancements in regulatory frameworks and workplace standards, industries worldwide continue to record high rates of accidents, hazardous exposures, and occupational illnesses. The manufacturing sector, particularly grain and maize milling, is recognized as a high-risk industry due to exposures such as flour dust, noise, unguarded machinery, and repetitive handling tasks. Flour dust exposure, for example, is widely associated with respiratory complications including occupational asthma, allergic rhinitis, and long-term sensitization among workers. These persistent risks underscore the importance of comprehensive Safety, Health and Environmental (SHE) management systems in industrial environments.

In Zambia, workplace safety is regulated through several legislative instruments, including the Occupational Health and Safety Act No. 36 of 2010, the Factories Act, and the Environmental Management Act No. 12 of 2011 administered by the Zambia Environmental Management Agency (ZEMA). These laws require employers to identify, evaluate, and control workplace hazards and to ensure the implementation of preventive measures such as risk assessments, safety training, inspections, monitoring, and the provision of personal protective equipment (PPE). Despite the existence of this regulatory framework,

compliance across many industrial operations remains inconsistent, and workplace accidents are still frequently reported. This gap between regulatory expectations and actual practice highlights the need for empirical assessment of SHE implementation in specific industrial settings.

Kwacha Milling Industry, located in Chipata District, is an important player in Zambia's grain-processing sector. However, like many milling operations, it faces various SHE challenges, including dust emissions, machine-related injuries, noise exposure, and inconsistent adherence to safety procedures. Anecdotal evidence suggests that although certain SHE measures are in place, their effectiveness in reducing hazards may be limited by operational constraints, resource shortages, and gaps in supervision. Yet, there is limited empirical research assessing the actual level of SHE effectiveness within Zambia's milling industry, creating a critical knowledge gap in occupational safety research and policy.

This study was therefore undertaken to evaluate the organizational and operational factors influencing the effectiveness of SHE management practices at Kwacha Milling Industry. By examining existing safety measures, assessing their perceived effectiveness, identifying implementation challenges, and exploring the outcomes of these measures, the study provides evidence-based insights that can guide improvements in industrial safety performance and support compliance with national regulatory frameworks.

The specific objectives of the study were:

1. To identify the SHE measures implemented at Kwacha Milling Industry.
2. To evaluate the effectiveness of these SHE measures in promoting compliance with legal frameworks.
3. To analyze the challenges encountered in implementing SHE measures at the company.
4. To examine the outcomes of SHE measures on workplace safety and employee well-being.

2. Literature Review

This chapter provides an overview of other people's researches on safety, health and environmental practices and their findings, ranging from global perspective to Zambian perspective. The literature review provided is in line with the objectives of the study.

According to the Ministry of Labor and Social Security (2021) ^[34], to improve the well-being of workers in industries in Zambia from hazards that come about and affect the health workers, communities, as well as the environment, there is need to promote enforce occupational health and health standards in industrial workplaces so as to ensure that there is safe and health working environment free of or less hazards. Further, the ministry of labor has also made statements that in order protect workers, factories and the community, the factories act must be enforced. The National Health Insurance Management Authority (2020) ^[35] has also stated that the importance of regulations such as the occupational health and safety practices in industries is to protect workers from hazards and accidents. This includes protecting workers from illnesses, accidents and promoting a safe working environment.

In a study conducted by Hildah Kalulu (2017) ^[36], it was stated that the importance of environmental legislations such as the environmental protection and pollution control act,

gives people the obligation to voice out and participate in environmental formulation meetings. This is a requirement under the act and helps reduce the impact that industries have on the environment.

Similarly to a study conducted by Cuthbert Makondo & Sydney Sichilima (2015) ^[37], the importance of environmental regulations in Zambia is to regulate environmental pollution and control, although there have been setbacks in implementing legislations. They further stated that there have been revisions of environmental regulation acts due to evolving and expansion in the industry sector. Thereafter, they had mentioned that the current environmental regulation which industries in Zambia adhere to is the environmental management act. This legislation provides specifications and environmental practices should be conducted and not conducted so as to regulate emission of harmful dust, and other harmful substances.

In Zambia, the national regulatory framework is anchored in several key legislative instruments. The Occupational Health and Safety Act No. 36 of 2010 is the cornerstone of workplace safety, mandating employers to ensure the health, safety, and welfare of their employees through risk assessments, safety training, and the provision of personal protective equipment. Complementing this is the Factories Act (Chapter 441), which governs working conditions in industrial settings, including ventilation, sanitation, and fire safety. Environmental concerns are addressed through the Environmental Management Act No. 12 of 2011, administered by the Zambia Environmental Management Agency (ZEMA), which ensures compliance with environmental standards and pollution control. Oversight and enforcement of these laws are carried out by the Ministry of Labor and Social Security, which conducts inspections and aligns national policies with international best practices. Together, these frameworks ensure a multi-layered approach to SHE management, promoting safer workplaces and sustainable industrial development.

3. Methodology

3.1 Research Design

This study employed a mixed-methods cross-sectional design, integrating both quantitative and qualitative approaches to systematically examine the effectiveness and implementation gaps of Safety, Health and Environmental (SHE) management practices at Kwacha Milling Industry. The quantitative component involved the administration of structured questionnaires to generate numerical evidence on employee perceptions of SHE measures, while the qualitative component used semi-structured interviews to provide deeper insights into operational challenges and organizational processes. The mixed-methods design enhanced the comprehensiveness, validity, and contextual interpretation of the study findings.

3.2 Study Area

The study was conducted at Kwacha Milling Industry, located in Chipata District, Eastern Province of Zambia. The company is a major agro-processing facility specializing in maize milling. Milling operations typically generate dust emissions, noise, ergonomic risks, and mechanical hazards, making the facility an ideal site for investigating the functionality of SHE systems within Zambia's manufacturing sector.

3.3 Study Population

The target population comprised all employees working at Kwacha Milling Industry across various operational departments, including production, maintenance, safety, logistics, and human resources. These groups were selected because their daily roles expose them to different categories of occupational hazards, thereby providing a comprehensive overview of SHE practices within the organization.

3.4 Sample Size and Sampling Procedure

A sample of 200 respondents was selected using Yamane's sample size determination formula:

$$n = N / (1 + N(e^2))$$

Where N represents the total workforce and e is the desired level of precision (0.05). Stratified random sampling was used to ensure adequate representation from all departments. Employees were stratified according to operational roles, after which simple random sampling was applied within each stratum. This sampling technique minimized selection bias and enabled the capture of diverse perspectives on SHE measures.

3.5 Data Collection Instruments

3.5.1 Structured Questionnaires

Structured questionnaires with predominantly closed-ended questions were used to collect quantitative data. The questionnaire consisted of four sections:

1. Demographic information
2. SHE measures implemented
3. Perceived effectiveness of SHE measures
4. Challenges encountered in implementation

The questionnaire was pre-tested on a small subset of employees outside the main sample to ensure clarity, reliability, and internal consistency.

3.5.2 Online Google Forms

Some questionnaires were distributed electronically via Google Forms to employees who were unavailable physically due to work shifts or logistical constraints. This ensured complete coverage of the targeted sample.

3.5.3 Semi-Structured Interviews

Qualitative data were collected through semi-structured interviews with selected supervisors and SHE personnel. Interview guides focused on operational challenges, compliance issues, and the organizational culture surrounding safety and environmental management.

3.6 Data Collection Procedures

Data collection was conducted over a four-week period. Permission to conduct the study was obtained from the management of Kwacha Milling Industry. Trained research assistants facilitated questionnaire administration and interview sessions. Respondents were assured of confidentiality and anonymity, and participation was voluntary.

3.7 Data Analysis

3.7.1 Quantitative Data

Quantitative data were coded and analyzed using Microsoft Excel. Descriptive statistics including frequencies, percentages, and graphical illustrations were used to summarize respondents' perceptions of SHE practices.

Tables and charts were generated to present trends in effectiveness ratings and implementation gaps.

3.7.2 Qualitative Data

Qualitative data were analyzed using thematic analysis. Interview transcripts were reviewed, coded, and grouped into recurring themes related to monitoring, communication, resource limitations, and adherence to SHE procedures. This analysis helped contextualize and explain the quantitative findings.

3.8 Ethical Considerations

Ethical standards were upheld throughout the study. Informed consent was obtained from all participants prior to data collection. Respondents were assured that participation was voluntary and that they could withdraw at any time without consequence. Data were handled confidentially and stored securely. Permission to conduct the study was granted by Kwacha Milling Industry management, and all procedures complied with ethical guidelines for research involving human participants.

4. Results

This chapter presents and discusses the findings of the study on the effectiveness and implementation gaps of Safety, Health and Environmental (SHE) management practices at Kwacha Milling Company in Chipata District. The presentation of results follows the study objectives and integrates both quantitative and qualitative findings. The discussion is aligned with relevant literature and the Zambian regulatory framework to enhance interpretation and academic rigor.

4.1 Gender of Respondents

A total of 200 respondents participated in the study, comprising 104 males (52%) and 96 females (48%). This distribution indicates a relatively balanced representation of both genders within the study population (Figure 2).

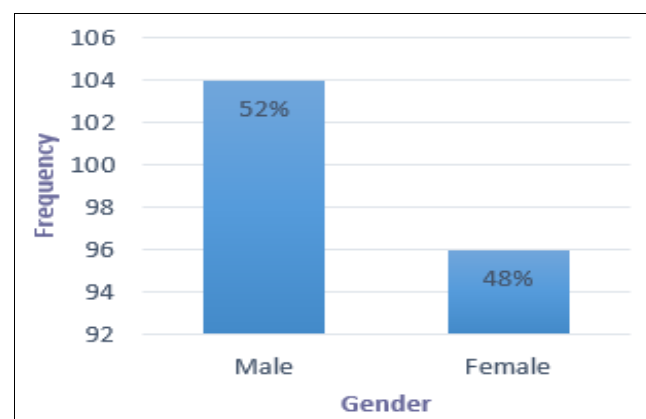


Fig 2: Gender

4.2 Educational levels

The educational qualifications of the 200 respondents are summarized in Table 1. The majority of respondents held either trade certificates (41.7%) or diplomas (36.7%), indicating a workforce largely composed of mid-level skilled personnel. A smaller proportion of respondents reported holding a bachelor's degree (20%) or a Grade 12 certificate (1.7%).

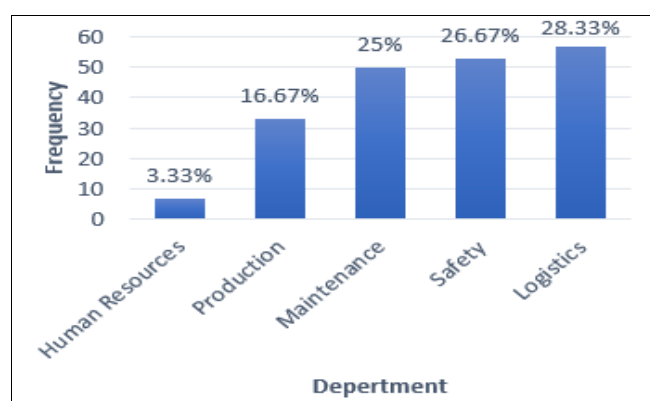
Table 1: Educational levels of respondents

Qualifications	Frequency	Percentage
Grade 12 certificate	3	1.67
Degree	40	20
Diploma	73	36.67
Trade Certificate	84	41.67
Total	200	100

These results demonstrate that the respondent pool predominantly possesses vocational and diploma-level qualifications, reflecting a workforce with practical and technical competencies.

4.3 Departmental Affiliation of Respondents

The departmental distribution of the 200 respondents at the Kwacha Milling Industry is presented in Figure 3. The largest proportion of respondents belonged to the logistics department (28.3%), followed by the safety department (26.7%) and maintenance (25%). Fewer respondents were drawn from the production department (16.7%) and human resources (3.3%).

**Fig 3:** Departments of respondents

4.4 Number of years worked at the company

The distribution of respondents based on their length of service at the company is presented in Table 2. Nearly half of the respondents (48%) had worked for less than one year, indicating a relatively young workforce that may still be acclimating to the established safety, health, and environmental (SHE) systems. Equal proportions of respondents reported tenures of 1–3 years (25%) and 4–6 years (25%), while a small minority had been employed for more than six years (2%).

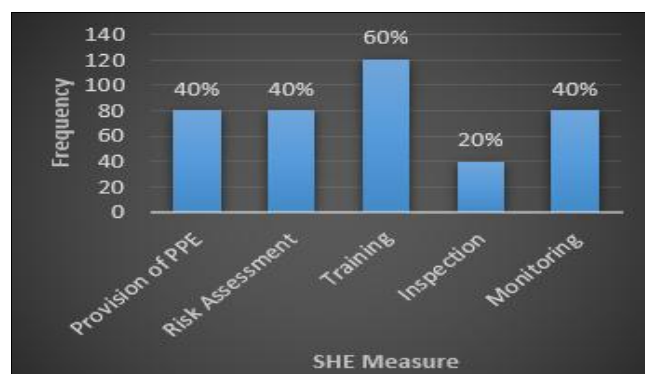
Table 2: Number of years worked

Number of years worked	Frequency	Percentage
>6 yrs	4	2
1–3 yrs	50	25
4–6 yrs	50	25
<1 yr	96	48
Total	200	100

4.5 Current SHE Measures being implemented and their effectiveness

The first objective sought to identify the Safety, Health, and Environmental (SHE) measures adopted at Kwacha Milling (Figure 4). Findings indicated that the company has implemented several key SHE measures, including Provision of Personal Protective Equipment (PPE), risk assessment, training, inspection, and monitoring. These

measures represent the foundational administrative controls required by Zambian occupational health and safety legislation (Occupational Health and Safety Act; Factories Act).

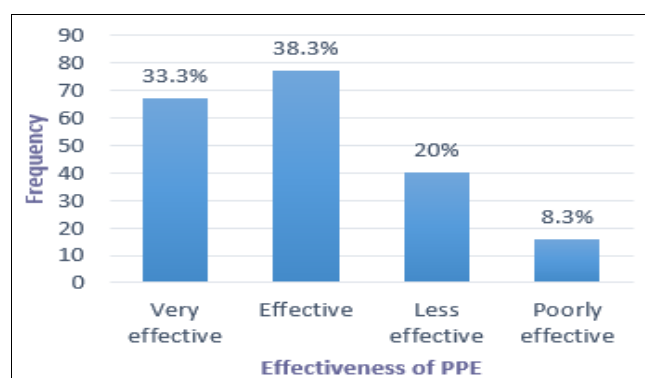
**Fig 4:** SHE Measures

Effectiveness of SHE measures

The second objective evaluated the effectiveness of the implemented SHE measures, which included PPE, Risk Assessment, training, inspection, and monitoring.

Effectiveness of PPE measures

The figure below shows the effectiveness of PPE at Kwacha Milling as rated by respondents (figure 5).

**Fig 5:** Effectiveness of Provision of PPE

Most respondents rated PPE as either effective or very effective, indicating that PPE plays a significant role in reducing exposure to workplace hazards. However, a notable minority expressed concerns regarding comfort, durability, and timely replacement. Qualitative findings revealed delays in PPE replacement and discomfort during hot working conditions. These findings suggest that while PPE provision meets minimum legal requirements, improvements in quality management and distribution systems are necessary to achieve optimal protection.

Effectiveness of Risk Assessment

Risk assessment practices were largely perceived as effective, with 72% of respondents rating them positively. This suggests that hazards are generally identified and documented. However, limited employee involvement and delayed corrective actions were highlighted in qualitative responses. This indicates that risk assessment processes require stronger worker participation and faster implementation of mitigation measures to enhance effectiveness.

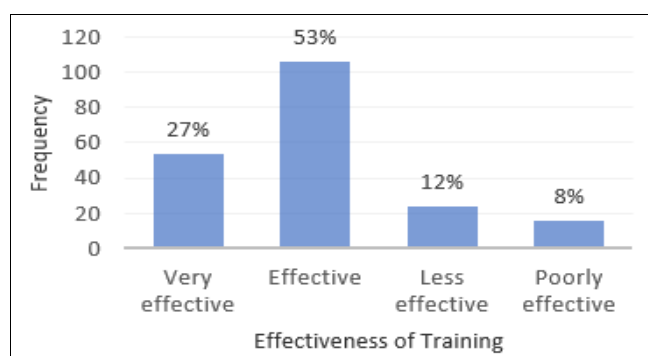
Table 3: Effectiveness of Risk Assessment

Effectiveness of Risk Assessment	Frequency	Percentage
Very effective	10	5
Poorly effective	16	8
Less effective	30	15
Effective	144	72
Total	200	100

A combined 23% of respondents rated risk assessment as either less effective (15%) or poorly effective (8%). The findings, therefore, suggest that although risk assessment is broadly effective within the company, improvements are needed to enhance its thoroughness, reliability, and stakeholder engagement to achieve higher levels of effectiveness.

Effectiveness of Training

The findings in Figure 7 reveal that out of 200 respondents, the majority (106), representing 53%, indicated that the training provided was effective. Additionally, 54 respondents (27%) rated the training as very effective, while 24 respondents (12%) considered it less effective, and 16 respondents (8%) viewed it as poorly effective.

**Fig 6:** Effectiveness of training

These results suggest that the training initiatives at the organization are generally well-received, with a combined 80% of respondents acknowledging them as either effective or very effective. This indicates that the training programs are contributing positively to employee development and workplace safety awareness. However, the presence of 20% of respondents who rated the training as less or poorly effective highlights areas that may require improvement.

Effectiveness of inspection

The findings in Table 7 show that out of 200 respondents, the majority (96), representing 48%, indicated that inspection activities at Kwacha Milling Company are effective. About 70 respondents (35%) considered inspections less effective, while 30 respondents (15%) rated them as poorly effective, and only 4 respondent (2%) viewed them as very effective.

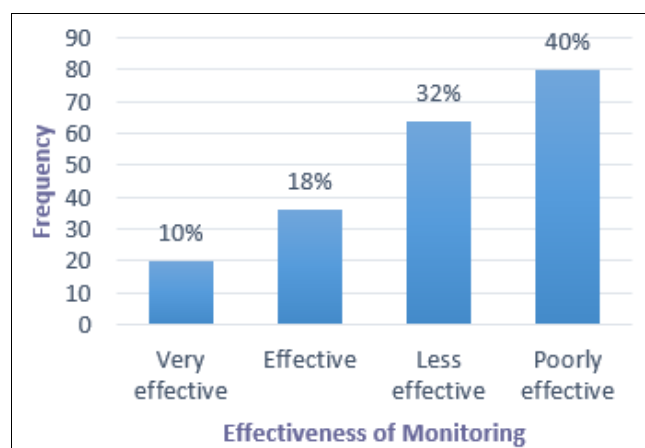
Table 4: Effectiveness of inspection

Effectiveness of inspection	Frequency	Percentage
Less effective	70	35
Very effective	4	2
Poorly effective	30	15
Effective	96	48
Total	200	100

These results suggest that although inspection exercises are conducted regularly at Kwacha Milling Company, there is room for improvement in their quality and consistency. The findings imply that inspection activities are partially effective in identifying non-compliance issues and ensuring corrective measures are implemented. The moderate level of effectiveness may be due to factors such as inadequate follow-up on inspection findings, limited resources, or lack of employee participation during inspection exercises.

Effectiveness of Monitoring

The findings in Figure 7 indicate that out of 200 respondents, the majority (80), representing 40%, rated monitoring activities as poorly effective. Additionally, 64 respondents (32%) considered monitoring to be less effective, while 36 respondents (18%) stated it was effective, and only 20 respondents (10%) viewed it as very effective.

**Fig 7:** Effectiveness of Monitoring

These results suggest that monitoring practices at the organization are perceived as largely ineffective by most respondents. With a combined 72% (144 individuals) rating monitoring as either poorly or less effective, it is evident that current monitoring efforts may lack consistency, thoroughness, or follow-through. This moderate to low level of effectiveness could be attributed to factors such as

inadequate monitoring tools, insufficient training of personnel, or lack of timely feedback and corrective action. This represents a major implementation gap and undermines the sustainability of other SHE measures, as ineffective monitoring allows unsafe practices to persist.

Outcomes of the SHE measures implemented



Fig 8: Outcomes of SHE measures

Despite implementation challenges, the SHE measures have yielded positive outcomes, including improved hazard reporting, enhanced working conditions, reduced injury rates, and improved regulatory compliance. These outcomes demonstrate that SHE practices contribute meaningfully to workplace safety when adequately supported.

5. Discussion of Findings

In this study, 200 respondents were asked about their background or personal details such as their gender, their school qualification, the department and number of years worked in the first section. Their first asked to state their gender of which 48% of the respondents were female while 52% of the respondents were male. There were then asked to state their qualification, of which 2% of the respondents did not indicate their qualifications, 1.67% had stated secondary school qualification, 41.67% indicated certificate / diploma, 20 % indicated degree while 36.67% indicated diploma.

Thereafter, they were asked to indicate the department which they worked under. 16.67% of the respondents had indicated that they work under the production department, 3.33% of the respondents had indicated that they work under the department of the human resources, 25% had indicated that they work under the department of maintenance, 26.67% of the respondents had indicated that they worked under the department of the safety and 28.33% had indicated that they worked under the department of the logistics. Lastly, there were asked to indicate the number of years they had worked for the organization. 25% of the respondents has indicated that they had worked for 1 – 3 years, 2% had indicated that they had worked for more than 6 years, 48% had indicated that they had worked for less than a year and 25% had indicated that they had worked for 4 – 6 years.

5.1 Determine SHE measures adopted at Kwacha Milling

The first objective was to determine the safety, health and environmental strategies that are practices at the kwacha milling company. The SHE strategies that were practices include had stated adequate monitoring, clear communication, training, Provision of PPE and risk assessment. Safety, health and environmental measures are

very essential because they play a role in the reduction of workplace accidents and protects public health and the environment.

Supporting the statement made above, a research conducted by Mubita (2016) ^[38], found that inspection was mentioned to be one of the most effective tools implemented so as to prevent or reduce accidents in industries. He further stated that some of the workers did not follow safety regulations in the absence of their supervisors.

According to a study conducted by Jamil zara & Nizan Isha (2023) ^[39], it was stated that communication and training were key elements in implementing effective health and safety strategies in industries by minimizing the rate of accidents and injuries. They also highlighted in another study by the International Labor Organization that lack of communication and training in some industries resulted in high rates of accidents. They further added that communication is crucial in public relations, organization gain positive outcomes such as the involvement of workers in safety policy formulation, their commitment and performance towards regulations.

In a study that was conducted by Samuel Kockar & Katarina Holla (2024) ^[40], it was found that one of the safety, health and environmental strategies that was implemented was risk assessment. This strategy plays an essential role in the prevention of accidents. They further stated that risk assessment was significant as it assesses the magnitude of hazards and what solutions need to be implemented.

In another study conducted by Charity Kamwale, Wellington Thwala & Erastus Mwanaumo (2023) it was mentioned that training was one of the concerned measures that safety officers must enforce so as to carry out their jobs effectively and eliminate accidents. This will help workers understand workplace hazards and how to respond to them. Similarly, Demirkesen & Ardit (2015) also stated that safety training is essential because it helps and safety employees understand safety procedures and how to handle hazards and accidents in industries. They mentioned that one of the safety trainings that were mentioned by respondents according to a research that they conducted include safety lifting techniques, machine operation and correct use of personal protective equipment. Therefore, they also stated that these safety training were not only limited to construction companies, but also other different industries.

6. Conclusion

According to findings displayed in the previous chapter, the Kwacha Milling Industry has a robust documentation of safety, health and environmental management measures. The industry also encounters challenges such as inadequate safety officers and lack of communication. However, it can be said that the safety, health and environmental measures implemented are effective in promoting compliance with legal frameworks following the outcomes of the SHE measures towards the establishment of a safe working environment. Despite the effectiveness of the SHE measures implemented, there are still some areas that need improvement following the challenges mentioned.

The findings of the results promote sustainability practices in industries through awareness and knowledge exchange through research conferences. Not only does this research contribute to sustainability, but also contribute to disaster management in order to protect human life, which is of fundamental value. This will be archived through promoting

effective safety, health and environmental management measures.

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