



The influence of mining safety management system planning on the safety performance of pt. dairi prima mineral in dairi regency

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Abstract

This study investigates the relationship between safety performance planning, mining safety management, and regional development, focusing on the case of PT Dairi Prima Mineral in Dairi Regency. The findings reveal that while the impact of planning and management review, as well as performance improvement, on safety performance is negative, the remaining three hypotheses indicate positive and significant influences. PT Dairi Prima Mineral plays a vital role in supporting safety performance planning, ensuring high levels of safety and responsibility in their operational activities. The study emphasizes the close relationship and mutual influence between regional development and planning for mining safety management systems. Incorporating prudent natural resource management, especially in the mining sector, is crucial for achieving sustainable regional development. Effective planning for mining safety management systems should include comprehensive assessments of environmental and social impacts associated with resource extraction. By adopting sustainable management practices, responsible utilization of natural resources can be realized, minimizing negative impacts and fostering an environment conducive to sustainable regional development. This study provides valuable insights for mining companies and policymakers to promote sustainable practices and enhance safety performance within the realm of regional development.

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Keywords: safety performance planning, mining safety management, regional development, natural resource management and sustainable practices

Introduction

PT Dairi Prima Mineral (DPM) is a zinc mining project located in the Sopokomil area of Dairi Regency, which itself is part of North Sumatra Province in Indonesia. PT Dairi Prima Mineral is also a contributor to the Gross Regional Domestic Product (GRDP) in the mining sector. PT DPM mines sulfide zinc ore as well as secondary ore, namely galena, which is a mineral formation of sulfide tin and silver. PT DPM is a joint venture between Non Ferrous (NFC) in Beijing, China, with a 51% share ownership, and Bumi Resources with a 49% share ownership.

The management system currently implemented by PT DPM refers to Ministerial Decree No. 1827.K/30/MEM/2018 on Guidelines for the Implementation of Good Mining Practices, Director General of Minerals and Coal Decree No. 185.K/30/DJB/2019 on Technical Guidelines for Mining Safety Implementation and SMKPI Implementation, Assessment, and Reporting, ISO 14001:2015 for Environmental Management System, and ISO 9001:2015 for Quality Management System. Through this systems approach, the aim is to integrate the management systems with each other. As a responsible corporate citizen in Indonesia and the global mining community, PT DPM is committed to implementing and maintaining the highest standards for environmental care, health and safety, and corporate governance through the implementation of mining safety

policies that encompass occupational health and safety (OHS) and operational safety (OS) to minimize mining accidents, occupational accidents, and work-related illnesses. Accidents that occur in the mining environment are often referred to as mining accidents, which must meet the criteria set by Ministerial Decree No. 1827K/30/MEM/2018, namely that the accident truly occurred, resulting in injuries to mine workers or authorized individuals, as a result of mining activities, during the working hours of injured employees, and within the mining concession area (IUP). According to Singh et al. (1999), several factors hinder the success of occupational safety programs, including poor work planning, inadequate implementation of safety training, insufficient safety budgets, and failure to conduct accident investigations and evaluations according to the required procedures.

Literature

Occupational Health and Safety in Mining (K3 Pertambangan) encompasses all activities to ensure the safety and health of mine workers through the management of occupational safety, occupational health, working environment, and occupational health and safety management systems. Meanwhile, Mining Operational Safety (KO Pertambangan) involves activities to ensure safe, efficient, and productive mining operations, including the management and maintenance of facilities, infrastructure, installations, feasibility of mining facilities, infrastructure and equipment, technical competency of personnel, and evaluation of mining technical studies. Heinrich (1931) introduced the first domino theory of accident causation, stating that there are 5 (five) factors that sequentially contribute to accidents: the negative traits of an individual, which lead to unsafe behaviors and conditions, resulting in accidents and resulting injuries. Bird Jr. & Germain (1990) revised Heinrich's domino theory to better reflect the cause-and-effect relationship of accidents by incorporating management influences.

The implementation of Mining Safety Management Systems (SMKP) is regulated by Ministerial Decree No. 1827.K/30/MEM/2018 on Guidelines for the Implementation of Good Mining Practices and Director General of Minerals and Coal Decree No. 185.K/30/DJB/2019 on Technical Guidelines for Mining Safety Implementation and SMKP Implementation, Assessment, and Reporting in the mining sector. SMKP is mandatory and must be implemented by all mining companies or mining service companies. SMKP is a management system that forms part of the overall company management system to control mining safety risks, including both Occupational Health and Safety in Mining (K3 Pertambangan) and Mining Operational Safety (KO Pertambangan). SMKP is obligatory for all companies involved in the mining industry, including mining companies and mining service companies.

In 2020, the Minister of Energy and Mineral Resources issued Ministerial Regulation No. 7 of 2020 on Procedures for Granting Mining Areas, Licensing, and Reporting in Mineral and Coal Mining Activities. As a result, all companies operating in mining areas are required to have and implement SMKP systems. Companies are obligated to prepare and submit periodic reports to the Minister through

the Directorate General or the Governor, in accordance with their respective authorities, including, among other things, internal audit reports on the implementation of Mining Safety Management Systems (SMKP), no later than 30 calendar days after the end of each quarter. The Mining Safety Management System for Mineral and Coal Mining (SMKP Minerba) is applied by holders of Exploration Mining Business Permits (IUP Eksplorasi), Exploration Mining Business Permits Areas (IUPK Eksplorasi), Production Operation Mining Business Permits (IUP Operasi Produksi), Production Operation Mining Business Permit Areas (IUPK Operasi Produksi), Special Production Operation Mining Business Permits for processing and/or refining, and mining service companies. The implementation of SMKP Minerba consists of the following elements: (1) policy; (2) planning; (3) organization and personnel; (4) implementation; (5) monitoring, evaluation, and follow-up; (6) documentation; and (7) management review and performance improvement. Workplace safety performance is one aspect of overall company performance. It is a measure of an organization's success in preventing accidents, similar to measures of success in terms of time, quality, and cost (Hasan & Jha, 2013). Workplace safety refers to safety related to machinery, aircraft, tools, materials and their processing, workplace infrastructure, environment, and work procedures (Suma'mur, 1989). The measurement of safety performance is divided into two methods: reactive method, which is conducted after an accident with the aim of evaluation and comparison of achieved goals, and proactive method, which assesses whether the existing system is functioning properly or not (Cooper & Phillips, 2004). In this study, the focus is on the safety performance of the organization's work.

Research Method

This study employed a descriptive research method with a quantitative approach. The research was conducted at PT Dairi Prima Mineral, located in Dairi Regency. The study spanned a duration of 2 (two) months, from March 2023 to June 2023. The research subjects included all employees of PT Dairi Prima Mineral, totaling 127 individuals. The research object focused on variables that mutually influenced each other, including the Planning of Mining Safety Management System and safety performance.

The population of this study consisted of all employees working at PT Dairi Prima Mineral in Dairi Regency, totaling 127 individuals. The sample size was determined based on a survey conducted at the beginning of the research, which yielded a population size of 127 employees. Considering the homogeneity of the population members, the author selected 50% of the population, resulting in 64 respondents (Sudjana, 1989: 107).

Result and Discussion

Based on the calculation results using SPSS 20 software and the data obtained, all coefficients of each variable have a positive and significant relationship with an alpha level of less than 0.05.

Table 1: Parameter Values of Independent Variables

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	41.933	6.836		6.134	.000
	X1	-.226	.047	-.433	-4.796	.000
	X2	.412	.073	.582	5.608	.000
	X3	.415	.068	.565	6.131	.000
	X4	.090	.070	.107	1.284	.204
	X5	-.571	.099	-.580	-5.775	.000
a. Dependent Variable: Y						
Y = 41,93 – 0.226x1 + 0.412x2 + -.415x3 + 0.090x4-0,57x5						

Based on the obtained results from the data, the coefficient of determination is $R^2 = 0.622$. This means that the variation in Planning (X1), Organization and Personnel (X2), Implementation (X3), Evaluation and Follow-up (X4), and Management Review and Performance Improvement (X5) variables can explain 0.622 of the variation in Safety Performance (Y).

The research results show that the coefficient of Planning (X1) on Safety Performance (Y) or ρ_{y1} is -0.433 with t-value = -4.796 and sig. 0.000. Since the t-value of -4.796 < t-table (1.658), the coefficient is not significant. Therefore, there is no significant influence of the Planning variable (X1) on Safety Performance (Y). On the other hand, Personnel (X2) shows a coefficient of 0.582 on Safety Performance (Y) or ρ_{y2} with t-value = 5.608 and sig. 0.000. Since the t-value of 5.608 > t-table (1.658), the coefficient is significant.

The calculation also yields that the coefficient of Implementation (X3) on Safety Performance (Y) or ρ_{y3} is

0.565 with t-value = 6.131 and sig. 0.000. Since the t-value of 6.131 > t-table (1.658), the coefficient is significant. Thus, there is a significant influence of Implementation (X3) on Safety Performance (Y). However, the coefficient of Evaluation and Follow-up (X4) on Safety Performance (Y) shows a coefficient of 0.107 with t-value = 1.284 and sig. 0.204. Since the t-value of 1.284 < t-table (1.658), the coefficient is not significant. For the variable Management Review and Performance Improvement (X5) on Safety Performance (Y), the coefficient is -0.580 with t-value = -5.775 and sig. 0.000. Since the t-value of -5.775 < t-table (1.658), the coefficient is not significant.

In aggregate, all variables, including Planning (X1), Organization and Personnel (X2), Implementation (X3), Evaluation and Follow-up (X4), and Management Review and Performance Improvement (X5), have a significant influence on Safety Performance (Y) (refer to Table 2).

Table 2: Anova

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	278.985	5	55.797	19.051	.000 ^b
	Residual	169.874	58	2.929		
	Total	448.859	63			
a. Dependent Variable: Y						
b. Predictors: (Constant), X5, X4, X1, X3, X2						

Effective planning serves as the foundation for an efficient safety management system. Through planning, safety risks can be identified, and preventive measures as well as responses to emergency situations can be designed. Planning also involves setting clear safety objectives and determining the necessary actions to achieve those objectives. With good planning, resources can be allocated efficiently to ensure the successful implementation of the safety management system. On the other hand, the influence of organization and personnel is related to the safety culture established within the company. An organization that prioritizes safety will have clear structures, assigned responsibilities, and effective communication. Additionally, skilled, trained, and safety-conscious personnel are valuable assets in achieving good safety performance. The commitment of the organization and the involvement of personnel in maintaining safety are crucial factors in creating a safe working environment.

Effective implementation involves the application and execution of established safety plans and policies. Concrete steps must be taken to translate planning into tangible actions. Good implementation involves consistency in following safety procedures, compliance with legal requirements, provision of adequate resources, and employee engagement in safety. Effective implementation can improve adherence to

safety procedures and reduce the risk of accidents.

Regular and comprehensive evaluation of safety performance allows for the identification of weaknesses, trends, and areas that require improvement. Effective evaluation is based on accurate data collection and careful analysis. The results of the evaluation should be followed by timely and effective follow-up actions. These actions can include procedure improvements, additional training, policy changes, or infrastructure enhancements. Good evaluation and follow-up ensure learning from experiences and continuous development in safety.

Management Review involves a thorough assessment of safety performance, policies, procedures, and established safety objectives. In the context of mining safety management systems, Management Review will involve a review of all aspects related to safety, ranging from planning and implementation to supervision and actual performance achieved. The outcomes of Management Review provide important information about the success of the safety management system and identify areas that require improvement. By conducting regular Management Reviews, mining companies can identify gaps between actual performance and established safety objectives and take necessary corrective actions.

On the other hand, Performance Improvement is closely related to the outcomes of Management Review. After conducting a comprehensive evaluation, the next step is to implement improvements and corrective actions to enhance safety performance. Performance Improvement involves a continuous improvement process based on the outcomes of Management Review. Improvements can include policy enhancements, procedure revisions, training enhancements, the introduction of new technologies, or changes in the organizational safety culture. By engaging in sustainable Performance Improvement, mining companies can reduce the risk of accidents and enhance overall safety performance.

The influence of Management Review and Performance Improvement on safety performance is crucial in the context of mining safety management systems. They complement each other and help companies address weaknesses, implement corrective actions, and achieve established safety objectives. By conducting regular Management Reviews and implementing sustainable Performance Improvement, mining companies can create a safer working environment and maintain optimal safety performance.

The connection between Mining Safety Management System Planning and Regional Development in Dairi Regency demonstrates the significant relevance of mining safety management system planning to regional development in Dairi Regency. Dairi Regency is a region rich in natural resources, including the mining sector. In regional development, planning for mining safety management systems becomes crucial to ensure that the utilization of natural resources is conducted in a sustainable and responsible manner. The safety management system will help reduce the risk of accidents and negative environmental impacts, allowing natural resources to be utilized efficiently and sustainably.

Poorly managed mining activities can have negative impacts on the environment, such as water and air pollution, land degradation, and loss of biodiversity. In the development of Dairi Regency, planning for mining safety management systems is highly important to ensure adequate environmental protection. Through effective planning, preventive measures, mitigation strategies, and environmental impact monitoring can be integrated into mining activities, minimizing environmental damage.

Safe and responsible mining contributes to social sustainability and community well-being in Dairi Regency. In regional development, planning for mining safety management systems will prioritize the safety and health of the local community. This involves the implementation of strict occupational safety standards, employee training, health monitoring, and active community participation in decision-making processes. Thus, planning for mining safety management systems ensures that mining activities contribute to the welfare and social progress in Dairi Regency.

Sustainable regional development involves a holistic consideration of economic, social, and environmental aspects. In the context of mining, planning for mining safety management systems will help ensure that mining is conducted responsibly, involving community participation, and providing sustainable economic benefits. This can create employment opportunities, increase regional income, and drive the development of infrastructure that supports sustainable economic growth in Dairi Regency.

Overall, planning for mining safety management systems

plays a crucial role in the development of the Dairi Regency. With effective planning, the sustainable utilization of natural resources can be achieved, environmental protection can be ensured, the safety and health of the community can be prioritized, and sustainable development can be realized. Planning for mining safety management systems ensures that mining activities are conducted with high safety standards, minimizing negative impacts on the environment and communities, and contributing to sustainable economic development. Thus, planning for mining safety management systems plays a vital role in guiding the development of the Dairi Regency towards sustainability and improved well-being.

Conclusion and Recommendation

The influence of planning and management review and performance improvement on safety performance is negative, while the other three hypotheses have positive and significant influences. PT Dairi Prima Mineral in Dairi Regency, as a company in the mining sector, plays a crucial role in supporting safety performance planning. By supporting safety performance planning, PT Dairi Prima Mineral can ensure that their operational activities are carried out with high levels of safety and responsibility, contributing to overall safety performance in the mining sector.

The development of the region and planning for mining safety management systems are closely interconnected and mutually influential, as exemplified by the wise management of natural resources, including the mining sector. In planning for mining safety management systems, it is important to consider the impacts of natural resource extraction on the environment and local communities. Sustainable management will ensure that natural resources are utilized responsibly, reducing negative impacts, and maintaining good environmental quality for sustainable regional development.

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