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Implementation of Emergency Response Management in Large-Scale Construction Projects: Literature Review

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ABSTRACT

Emergency Response Management (ERM) is a critical aspect of large-scale construction projects, where the risk of accidents and incidents can significantly impact worker safety, project continuity, and the company's reputation. This article aims to conduct a systematic literature review on the implementation of Emergency Response Management in the context of large-scale construction projects. By analyzing various relevant studies, this research identifies best practices, challenges, and factors influencing the effectiveness of Emergency Response Management. The review findings indicate that the success of ERM implementation highly depends on employee training, top management involvement, and the integration of emergency response plans into the organization's safety culture. Additionally, the study finds that the use of modern technology, such as management information systems and simulations, can enhance preparedness and response to incidents. The research also highlights the need for further studies to develop a comprehensive ERM framework that can be adapted across different construction project contexts.

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INTRODUCTION

One of the most dynamic and complex industries is large-scale construction projects.This project usually involves various stakeholders, such as contractors, subcontractors, architects, engineers, and workers. This complexity, combined with various external variables such as weather, location, and regulations, increases the risk of construction projects.Unexpected events, such as fires, workplace accidents, and natural disasters, can cause significant financial and reputational losses.As a result, emergency response management (ERM) becomes an important component in the planning and execution of construction projects..(Febrianti, 2023)

Emergency Response Management (EMTD) is a process intended to prepare for, respond to, and recover from incidents that can disrupt normal operations.In construction projects, emergency management (EMTD) not only functions to respond to incidents but also to mitigate the risks and consequences that may occur.An effective can help reduce incidents, improve worker safety, and ensure that the project is completed quickly and within budget.(MAWAR, 2024)

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The global construction industry faces complex challenges such as climate change, strict safety regulations, and cost efficiency pressures.Natural disasters such as earthquakes and floods can disrupt projects and cause significant losses.Therefore, it is important for companies to have an integrated emergency response plan from the beginning to the end of the project.Training for all parties involved is key, as adequate knowledge can accelerate response and reduce the impact of incidents.Research shows that projects with good emergency response training tend to be safer.Therefore, investing in human resource training is very important.(Wibowo, 2025)

Although the urgency of Emergency Response Management has been widely recognized, its implementation in the field still faces various obstacles.Many construction projects have not been able to implement emergency plans optimally, often due to insufficient training, lack of management support, or limited resources.On the other hand, the weak safety culture also hinders its effectiveness.Therefore, a deep understanding of best practices and common obstacles in the implementation of large-scale construction projects becomes very crucial.(Setiadi, 2021)

Based on the previous description, this research will examine the implementation of Emergency Response Management in large-scale construction projects in Indonesia, referring to the findings of relevant previous studies.

METHOD

This research uses the library study method, relying on various sources such as books, local and international scientific journals, academic articles, and previous research findings.The literature review aims to summarize the literature related to a topic, provide an overview of the latest developments in the field, and assist researchers in understanding, developing, and linking methods with philosophical approaches and relevant research findings.Data collection was conducted using mobile devices, laptops, and Wi-Fi networks, focusing on journals published in the last five years (2019–2024).

The literature search process was conducted using platforms such as Google Scholar and other academic reference sources.(Putro et al., 2023).

RESULTS AND DISCUSSION

The results of the search related to the implementation of emergency response management in large-scale construction projects indicate the presence of several relevant journals.The findings from the analysis of these journals are presented in the following Table 1.

Tittle	Year	Result
ANALYSIS OF THE IMPLEMENTATION OF THE OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM (SMK3) IN CONSTRUCTION PROJECTS (CASE STUDY OF THE REVITALIZATION AND EXPANSION OF THE CONTAINER DEPOT PROJECT AT PT. BHANDA GHARA REKSA DRIVE IV PALEMBANG)	2020	The Revitalization and Expansion Project of the Container Depot at PT BGR Divre IV Palembang is considered good in terms of the completeness of K3 facilities, with a score of 87.5% based on the Minister of Public Works Regulation No. 9 of 2008.However, the level of implementation of the Occupational Safety and Health Management System (SMK3) in the project only reached 74.01%, which is categorized as a moderate level.This indicates that the implementation of the Occupational Health and Safety Management System (SMK3) still needs to be improved to reach a more optimal standard.
STUDY ON THE IMPLEMENTATION OF THE OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM IN THE SEMANTOK DAM PROJECT PACKAGE ONE	2022	The implementation of the Occupational Health and Safety Management System (SMK3) in the Semantok Dam Project shows very good results with an achievement of 88.54%, according to the Likert scale.The majority of workers stated that the Occupational Health and Safety Management System (SMK3) has been implemented optimally, as evidenced by programs such as routine inspections by OHS experts and the implementation of safety morning meetings before work begins.Based on the hazard potential analysis using the IBPRP parameters, this project initially had a high accident risk level, with 37 extreme-risk incidents and 24 high-risk incidents.However, after risk control

		measures were implemented, all sub-tasks showed a reduction to a low-risk level.
ANALYSIS OF THE IMPLEMENTATION OF THE OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM (SMK3) AT PTPN VI IN PANGKALAN KOTO BARU DISTRICT, WEST SUMATRA	2022	This research shows that the readiness for the implementation of SMK3 in facing emergencies in the PTPN IV building is adequate.Workers' knowledge of the SMK3 SOP reached 100%, the definition of an emergency 84.23%, emergency response 76.12%, key elements in the emergency response system 78.32%, and the emergency recovery plan 94.4%.Overall, 84.41% of respondents have a good understanding of the implementation of SMK3 in emergencies at PTPN IV, in accordance with Government Regulation No. 50 of 2012.
THE UTILIZATION OF THE KANO METHOD FOR DETERMINING VARIABLE PREFERENCES IN THE CONSTRUCTION SAFETY MANAGEMENT SYSTEM CONSTRUCTION PROJECT IN SURABAYA	2023	The results of the Kano analysis from data obtained from 28 respondents of high-rise building project contractors in Surabaya indicate that there are 47 variables that need to be improved in their application within the one-dimensional category, with the highest variable being variable 37 (contractors have manuals, procedures, working drawings, work instructions, and related documents).Next, there are 6 variables in the attractive category, with the highest being variable 62 (the contractor conducts operational control on the maintenance of facilities, infrastructure, and equipment).Finally, there are 2 variables in the must-be category, with the highest being variable 47 (the contractor controls operations in the management of PPE and APK).
IMPLEMENTATION OF THE OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM (SMK3) IN INFRASTRUCTURE DEVELOPMENT PROJECTS	2023	This research shows that road construction project contractors have a high commitment to achieving project goals, with an average score of ≥ 70%.The main focus is on the road construction results and the quality of the pre-cast "U-ditch" product.In the implementation of the project, the application of SMK3 is carried out through planning management that refers to SMKK (Construction Safety Management System) in accordance with Permen PUPR No. 10 of 2021.The company's K3 performance follows the SMK3 procedures referring to PP No. 50 of 2012 and ISO 45001:2018, with an analysis result of K3 performance implementation reaching 74.8%, and the provision of work safety facilities at 71%.
IMPLEMENTATION OF SAFETY AND HEALTH RISK CONTROL SYSTEM Occupational health on the national road paving project in Langoan Ratihan-Belang	2024	Based on the analysis with partial tests and simple linear regression, a t-value of 13.074 was obtained, indicating that H0 is rejected and H1 is accepted.This indicates that the implementation of the Occupational Health and Safety Management System (SMK3) has a positive and significant impact on the accident rate in the National Road paving project in Langoan-Rataha-Belang, because the t-table value is greater than the t-count value.This study also shows that the implementation of the Occupational Health and Safety Management System (SMK3) by PT Permata Anugerah Yala Persada has a significant positive impact of 64.3% on occupational health and safety, supporting the company's efforts to achieve a zero accident target.This proves that the implementation of SMK3 in the company has been running well.
ANALYSIS OF THE IMPLEMENTATION OF SMK3 IN THE CONSTRUCTION PROJECT OF THE MAIN SERVICE BUILDING AT RSUD DR. SAIFUL ANWAR MALANG	2023	Based on the results of observations and data analysis, it was found that the implementation of the occupational health and safety management system by PT Permata Anugerah Yala Persada has a significant positive impact (of 64.3%) on occupational health and safety in order to achieve the company's zero accident target.This proves that PT Permata Anugerah Yala Persada has implemented the Occupational Health and Safety Management System (SMK3) quite well.
Evaluation of the Implementation of the Occupational Health and Safety Management System in the Puri Kelapa Gading Construction Project, North Minahasa	2023	The evaluation of the implementation of the K3 Management System in the Puri Kelapa Gading Minahasa Utara Construction Project shows "good" results for the K3 Management System (X1) and Safety Technology (X2), as well as "fairly good - good" for Occupational Health (X3).This indicates that the implemented OHS management system is functioning well and the safety technology is operating effectively.The management evaluates the occupational health aspect well, while the workers rate it as fairly good, which is due to the lack of adequate health facilities.

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Discussion and Analysis of Emergency Response Management Implementation in Large-Scale Construction Projects

The implementation of Emergency Response Management (MTD) and the Occupational Safety and Health Management System (SMK3) in large-scale construction projects in Indonesia shows varying results that reflect the challenges and successes encountered.In the Revitalization and Expansion Project of the PT. BGR Divre IV Palembang Container Depot, the K3 facilities were rated good with a score of 87.5%, but the implementation of the SMK3 received a moderate score (74.01%), indicating the need for improvement.Meanwhile, the Semantok Dam Project Package One achieved very good results with the implementation of SMK3 at 88.54%, supported by K3 programs such as routine inspections and safety mornings.At PTPN VI Pangkalan Koto Baru District, the readiness for implementing SMK3 in facing emergencies is recorded as good, with workers having full knowledge of SMK3 SOPs and a high emergency recovery plan (94.4%).

The use of the Kano method in construction projects in Surabaya identified 47 variables that need improvement, with a focus on documentation and operational control.In the infrastructure development project, the contractor demonstrated a high level of seriousness, with an OHS performance score reaching 74.8%.The implementation of risk control in the national road paving project Langoan Ratahan-Belang has proven to significantly reduce work accidents.The construction project of the Main Service Building at RSUD Dr. Saiful Anwar Malang also recorded a significant positive impact from the implementation of SMK3 on occupational health and safety, achieving a zero accident target.Evaluation of the Puri Kelapa Gading Project in North Minahasa shows good results despite shortcomings in health facilities.Overall, the results of this analysis indicate that the implementation of emergency response management and occupational safety management systems in large-scale construction projects in Indonesia still requires attention and improvement, particularly in terms of training, management involvement, and the integration of a safety culture.The use of modern technology has also been identified as an important factor in improving preparedness and response to incidents, which is key to reducing the risk and impact of workplace accidents in the future.

CONCLUSION

The implementation of Emergency Response Management and Occupational Health and Safety Management Systems in large construction projects in Indonesia demonstrates the importance of giving special attention to occupational safety and health aspects.Although there are several projects that have successfully implemented OHSMS effectively, there are still challenges to be faced, such as a lack of training, low participation from management, and the absence of a fully integrated safety culture.Success in emergency response management heavily relies on employee training, support from top management, and the integration of emergency response plans into the existing safety culture.Projects that have good emergency response training programs usually experience fewer incident occurrences, which demonstrates the importance of investing in human resource capacity development.In addition, the use of advanced technologies such as management information systems and simulation applications shows an increase in readiness and response to incident situations.Therefore, construction companies are expected to adopt these technologies to strengthen their safety management systems.To achieve accident-free goals and enhance workplace safety, companies must implement a comprehensive and flexible framework.Further research is needed to formulate more effective strategies in addressing existing challenges, so that construction projects can be carried out more safely and efficiently in the future.

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