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Strengthening Coastal Construction Safety Through Community-Based OHS Socialization, Education, and Training in West Aceh

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ABSTRACT

The implementation of Occupational Health and Safety (OHS) in port embankment construction is crucial for improving the security and durability of coastal infrastructure. The main goal of OHS is to prevent, reduce, or eliminate workplace accidents, which is particularly important given the potentially serious consequences of such incidents. This research focuses on the distribution and training of OHS practices, particularly stressing the proper use of personal protective equipment (PPE) to reduce accident risks. The program involved forming two groups of five people each, who participated in a structured socialization and training session. To assess the effectiveness of the program, participants were given pre- and post-activity questionnaires to measure their knowledge of OHS and safety building principles related to port embankment construction. The findings show that applying OHS principles led to significant improvements in safety measures and a reduction in workplace accidents. However, challenges persist, especially regarding the local community's comprehension of OHS protocols and consistent PPE usage. Ongoing training and more stringent supervision are recommended to improve OHS implementation further. These enhancements would ensure the safety and well-being of workers on construction sites more effectively.

Keywords: Embankment Construction; Implementation of OHS; Personal Protective Equipment; Risk Reduction; Safety Training

INTRODUCTION

Port embankments are critical infrastructure that serve to protect coastal communities from flooding and tidal inundation caused by ocean waves (Rahman & Rahman, 2014; Alvet et al., 2020). However, the construction of such embankments involves a high risk of occupational accidents that can endanger both workers and nearby residents (Sánchez-Triana et al., 2016; Adamo et al., 2020). As such, the implementation of Occupational Health and Safety (OHS) protocols in embankment construction is essential for enhancing building safety and minimizing workplace hazards (Sanggawuri et al., 2016; Bourahla et al., 2024). The proximity to the sea introduces additional dangers, including slips, falls, injuries from heavy machinery, and the risk of drowning (Denny et al., 2021; Leatherman et al., 2024). Furthermore, environmental factors such as extreme weather, slippery surfaces, and work at height complicate the safety management on construction sites (Indrayana et al., 2021; Khan et al., 2023).

To safeguard workers' health and safety, accident and occupational disease prevention measures must be implemented in accordance with Ministry of Public Works and Public Housing Regulation No. 10 of 2021 on the implementation guidelines for Construction Safety Management Systems (Suma'mur, 2006;

Amoah & Simpeh, 2020). The core aim of OHS is to prevent, reduce, or eliminate workplace accidents (Jaafar et al., 2017; Dufour et al., 2020). It is crucial to understand that accidents are inherent risks in every work process (Praseya, 2016; Fu et al., 2019), and even minor incidents can result in significant losses. Therefore, proactive measures must be efficiently implemented to reduce such impacts (Chang, 2015; Saglam et al., 2020).

The integration of safety building principles and OHS practices is essential to ensure the safety of both building occupants and construction workers (Karakhan, 2017; Kineber et al., 2023). Safety building includes secure architectural design, fire detection and protection systems, and effective evacuation routes, while OHS focuses on risk management to prevent workplace accidents and illnesses (Küçükarslan et al., 2023). Their synergy has proven to reduce incidents and promote a more productive and secure work environment (Nugraha & Anis, 2020; Egbumokei et al., 2024).

According to community service research (Febrianti & Salena, 2020), awareness and education positively influence the use of personal protective equipment (PPE) (Hossain et al., 2021). Nonetheless, a lack of understanding regarding PPE remains prevalent (Agarwal et al., 2020). PPE includes helmets, gloves, masks, protective footwear, and safety glasses, which are designed to mitigate physical, chemical, or biological hazards (Moniaga & Rompis, 2019; Sarkar et al., 2020).

In regions such as West Aceh and Nagan Raya, construction accidents have resulted in injuries and fatalities. These realities underscore the importance of community-based initiatives to promote the adoption of safety building practices and enhance OHS standards (Umeokafor, 2018; Ozobu et al., 2023). This study aims to raise awareness through socialization programs tailored to improve safety culture in embankment construction projects, ensuring safe and healthy environments for all involved (Du et al., 2020; Septanti et al., 2024).

Previous studies have emphasized the importance of OHS in general construction settings and the role of education in promoting PPE use. However, there is a lack of research focusing specifically on embankment construction in coastal regions, where environmental risks are uniquely challenging. The novelty of this study lies in its combined approach of safety building and community-based OHS education within the context of port embankment projects. The objective is to evaluate the effectiveness of targeted OHS socialization in improving awareness, discipline in PPE use, and overall safety performance among construction workers and surrounding communities.

METHODS

The community service activity (PKMBR) was conducted in Ujong Kalak Village, located in the Johan Pahlawan Subdistrict, which serves as the site for the ongoing port embankment construction project. This area is situated in West Aceh Regency, Indonesia.

The program focused on promoting the implementation of Occupational Health and Safety (OHS) in the construction of port embankment protection structures to enhance overall safety building practices. Construction workers involved in the port embankment project were engaged as participants (Mathew, 2023). The program was scheduled to run over a period of five months. A flow diagram outlining the activity plan is presented in Figure 1.

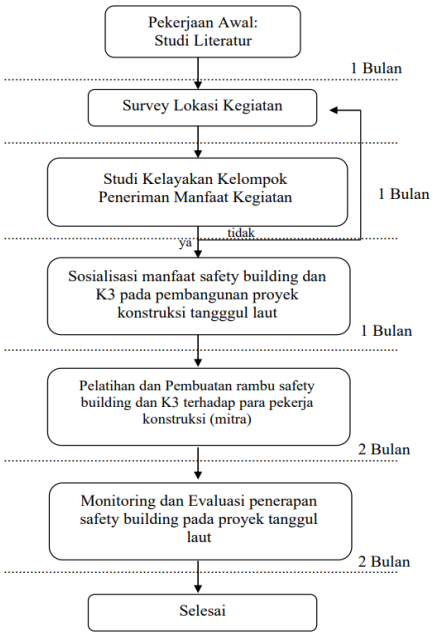

Figure 1. Activity Plan

Two partner groups were formed for the training activities, each consisting of five participants. These groups received training on the development of safety signage and OHS practices specific to embankment construction sites. In addition, they were introduced to methods of maintaining the port embankment infrastructure to prolong its service life. Maintenance training included soft engineering techniques, such as planting coastal vegetation like *Ipomoea pes-caprae* (beach morning glory) and *Casuarina equisetifolia* (beach she oak) around the embankment area to naturally reduce the impact of wave energy.

The effectiveness of the program was evaluated by measuring changes in participants' understanding of safety building and OHS concepts through pre- and post-training questionnaires. The aim of this evaluation was to assess the percentage increase in knowledge among the selected construction workers after the socialization sessions.

Each partner group, comprising five respondents, was given a questionnaire containing 16 items related to various aspects of OHS. The collected data was analyzed to determine the impact of the training program on awareness and behavior regarding workplace safety.

RESULTS AND DISCUSSIONS

The Occupational Health and Safety (OHS) socialization and training activities, which involved both community members and construction workers, significantly enhanced awareness of safety practices in the port embankment construction project. These efforts proved effective in raising awareness of project site hazards and encouraging preventive actions.

The following are the results of the questionnaire distributed to two partner groups, each consisting of five respondents:

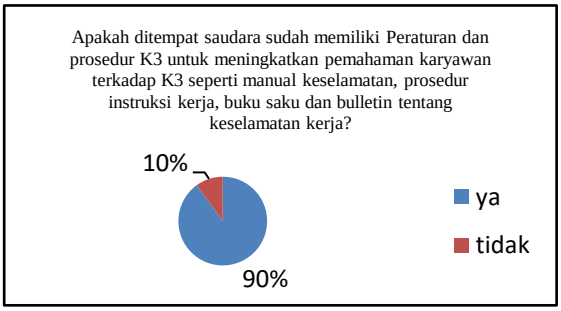

Figure 2. Question 1

90% of respondents reported that their workplace already had OHS regulations and procedures in place to improve employees' understanding of safety protocols. However, 10% indicated the absence of such provisions, highlighting a gap that needs to be addressed through policy implementation.

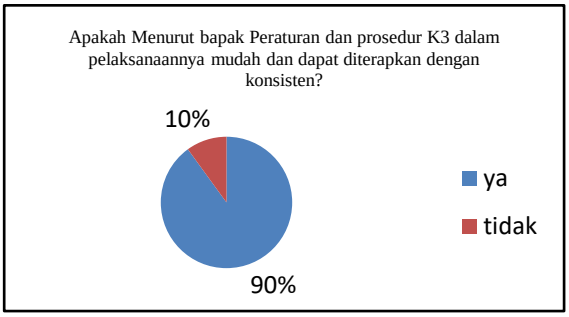

Figure 3. Question 2

A similar 90% stated they could consistently implement OHS procedures with ease, whereas 10% admitted to difficulties in consistent

application, indicating potential areas for further training and reinforcement.

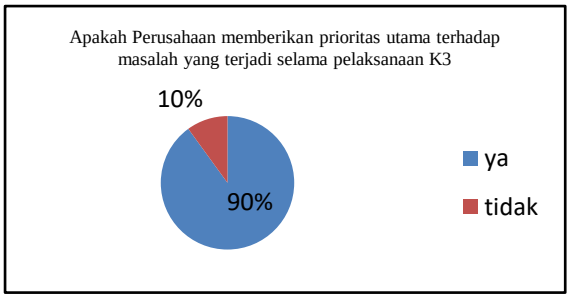

Figure 4. Question 3

Most respondents (90%) felt that their company prioritized OHS, yet 10% believed that it was not a major concern, suggesting varying degrees of management commitment across different teams or shifts.

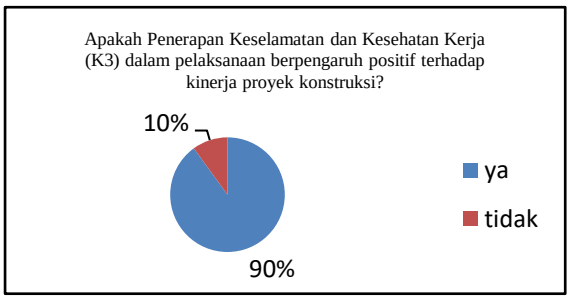

Figure 5. Question 4

90% of participants agreed that OHS positively influences construction project performance, while 10% did not perceive such an effect possibly due to a lack of immediate observable benefits.

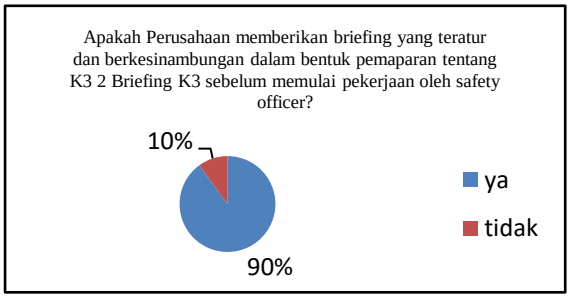

Figure 6. Question 5

Regarding routine briefings, 90% confirmed regular safety briefings were conducted by safety officers before starting work, but 10% noted the absence of such practices, implying a need for standardized briefing protocols.

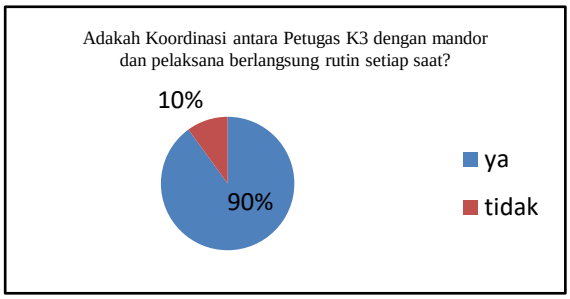

Figure 7. Question 6

Coordination between safety officers, foremen, and supervisors was acknowledged by 90% of respondents, though 10% reported the lack of such collaboration—an aspect critical for cohesive safety enforcement.

Figure 8. Question 7

90% of respondents affirmed full worker involvement in OHS briefings, while 10% stated they were excluded, underlining the importance of inclusive communication in safety planning.

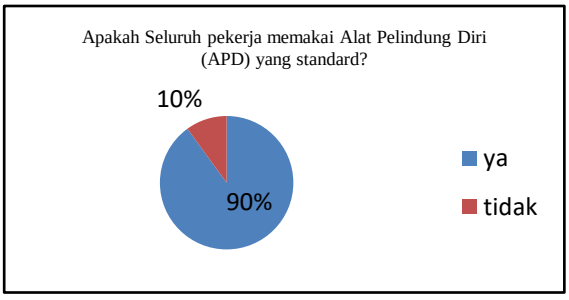

Figure 9. Question 8

Regarding personal protective equipment (PPE), 90% reported using standard PPE, but 10% admitted to not consistently using proper equipment emphasizing the need for better enforcement.

Figure 10. Question 9

All respondents (100%) indicated that workers were involved in OHS program planning, which is a positive indicator of participatory safety culture.

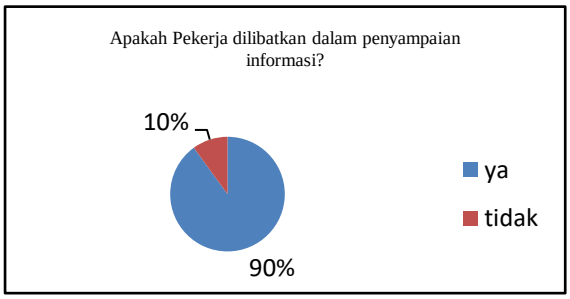

Figure 11. Question 10

90% stated that workers were involved in information dissemination, while 10% were not, suggesting areas for improvement in internal communication structures.

Figure 12. Question 11

90% reported that workers were encouraged to remind others about OHS practices; however, 10% said such peer reminders were not promoted.

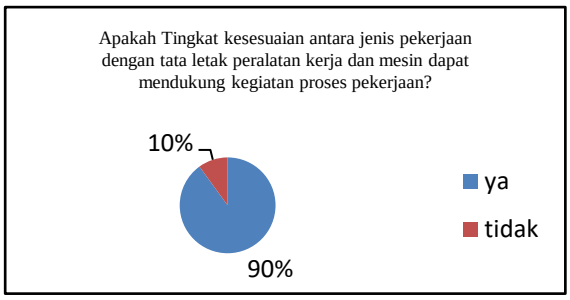

Figure 13. Question 12

90% believed that job types were well aligned with equipment layout and work processes, enhancing efficiency, whereas 10% disagreed implying ergonomic or spatial issues.

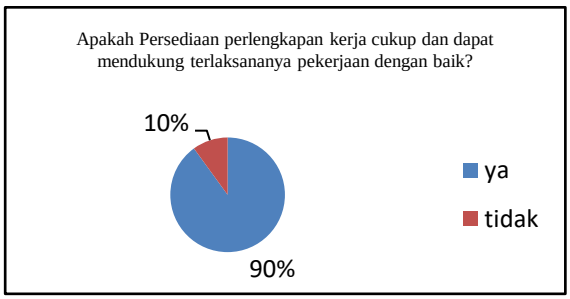

Figure 14. Question 13

Most respondents (90%) agreed that equipment availability supported job execution, but 10% felt the available resources were insufficient.

Figure 15. Question 14

90% of respondents confirmed the presence of health and hygiene measures at the project site, while 10% observed inadequate standards, pointing to room for sanitation improvement.

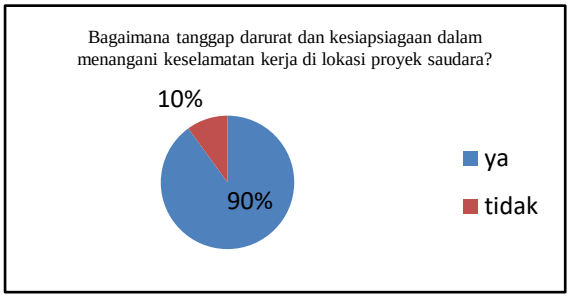

Figure 16. Question 15

On emergency preparedness, 90% acknowledged the presence of emergency response mechanisms, though 10% did not, which may impact safety during unforeseen incidents.

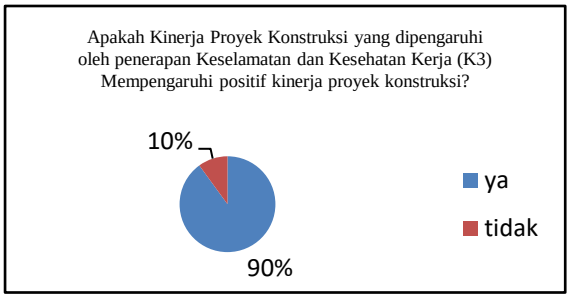

Figure 17. Question 16

Finally, 90% of respondents viewed OHS as positively influencing project performance, whereas 10% disagreed, again reflecting differences in perception and perhaps exposure to safety benefits.

Overall, the questionnaire results suggest that OHS implementation at the port embankment project is generally effective. However, several areas require further attention, including community understanding of OHS principles and consistent PPE use. While awareness of accident risks among workers is relatively high, discipline in adhering to safety protocols especially under adverse weather conditions typical of coastal sites needs improvement.

As part of the community engagement activities, participants were introduced to proper OHS signage, its symbols and meanings, and the correct usage of PPE to ensure worker safety.

Figure 18. OHS Socialization Session – Part 1

This image captures a training session where participants learned the importance of safety signage and how to interpret standard OHS symbols relevant to construction work environments.

Figure 19. OHS Socialization Session – Part 2

The image documents a hands-on session demonstrating the correct use of PPE, emphasizing its role in minimizing physical risks during embankment construction.

CONCLUSION

The implementation of occupational health and safety (OHS) measures in the construction project of the port embankment has been relatively effective in enhancing building safety and reducing the risk of workplace accidents. However, certain aspects, such as the local community's understanding and the consistent use of personal protective equipment (PPE), still require improvement. It is expected that

through advanced training programs and more intensive supervision, the application of OHS standards can be further optimized, thereby ensuring comprehensive safety across the project site.

Through continuous socialization and training initiatives, the risk of workplace accidents can be minimized, and the overall quality of embankment construction can be improved. The implementation of OHS measures not only safeguards workers and the surrounding community but also ensures the development of more resilient and secure infrastructure, capable of withstanding the high-risk challenges of coastal environments.

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