

DEVELOPMENT OF OCCUPATIONAL SAFETY AND HEALTH ISSUES ON CONSTRUCTION PROJECTS IN INDONESIA: A LITERATURE REVIEW

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Abstract: Occupational Safety and Health (OSH) are essential components of the construction industry, considering the high potential for accidents due to complex and high-risk working conditions. This study aims to explore various issues, challenges, and strategies that can be implemented to strengthen OSH practices in construction projects in Indonesia. The research was conducted using a literature review method, analyzing ten scientific articles published over the past five years (2020–2024). Findings indicate that the majority of workplace accidents are triggered by human factors, including negligence in the use of Personal Protective Equipment (PPE), limited understanding of safety procedures, weak supervision, and a lack of awareness of occupational risks. Furthermore, insufficient commitment and leadership from contractors and project owners have exacerbated the poor implementation of OSH. Other obstacles include limited training, the predominance of manual supervision systems, and the perception that safety is not a primary concern compared to project costs and deadlines. To address these challenges, approaches such as Design for Safety (DfS), the development

of a strong safety culture, and the adoption of digital technologies—such as Building Information Modeling (BIM), Internet of Things (IoT), and Virtual Reality (VR)—are considered crucial. This study is expected to enrich the understanding of OSH implementation on construction sites and promote a more proactive and sustainable safety management system.

Keywords: *Occupational safety and health, construction projects, safety culture, design for safety, work accidents*

INTRODUCTION

Occupational Safety and Health (OSH) in construction projects are an effort made to prevent work accidents in the construction field. Based on Law No. 11 of 2020, OHS is an important part of labor protection and a risk management system that must be implemented by every business actor, especially those with a high level of risk, as a prerequisite for operational feasibility and business legality. Every construction project company is required to meet OHS standards, this is useful for anticipating all the risks that will occur at the construction project site. Ensuring occupational safety and health for workers will have a good impact on the fulfillment of costs, quality and time on the project. This is in accordance with the regulations of Law Number 1 of 1970 concerning Safety as the legal basis for the application of OSH in Indonesia has been strengthened by the issuance of Law Number 36 of 2009 concerning health where in Articles 164-165 concerning Occupational Health it is stated that all workplaces are required to implement health efforts in both the formal and informal sectors including the State Civil Apparatus, TNI and Police.

Commitment plays an important role for each individual involved in the project in order to work with care and diligence, in accordance with the provisions set by the government and the company (Pashya, Machfudiyanto, & Suraji, 2024). Along with all kinds of developments that occur, companies in Indonesia have begun to switch to applying new knowledge and technology that can increase company productivity.

Construction activities that occur in a complex and dynamic environment can result in project accidents, work-related injuries, and fatalities (Machfudiyanto et al., 2023). Project accidents are caused by various factors, including the low understanding and discipline of workers in using personal protective equipment (PPE) such as project helmets, safety vests, protective shoes, and gloves. Not only that, unsafe working environment conditions, lack of regular training, and weak supervision from management also increase the potential for accidents. This is confirmed in a study by Faisal and Ilham Fansuri (2023), which states that human factors such as violation of procedures, misperception of hazards, and negligence in the application of safety standards are the main causes of work accidents in the construction sector. The workplace has potential hazards that can cause accidents or occupational diseases to the workforce (Putri & Assidiq, 2022).

Knowledge about K3 in Indonesia is still minimal to implement and is often ignored due to a lack of awareness about how important K3 is. The Annual Report on Labor and OHS Supervision, states that many companies do not have a strong OHS culture due to lack of training and low regulatory compliance (Ministry of Manpower RI. 2020).

This condition shows that the implementation of OSH in the construction sector is still not running optimally. Faisal and Fansuri (2023) stated that work accidents in the last five years were mostly caused by human factors, such as negligence in using personal protective equipment (PPE), misunderstanding of potential hazards, unsafe work environment, and weak supervision. Andi, Sumali, and Limansantoso (2022) also explained that weak leadership from the contractor led to low worker discipline towards safety procedures.

OHS-related regulations are already available in the national legal system, such as Law No. 1/1970 on Occupational Safety and Ministry of Public Works and Public Housing Regulation no. 10/2021 on Construction Safety Management System (SMKK). However, the effectiveness of the implementation of these regulations is still questionable. According to Kadir, Lestari, Tjahjono, Alfaro, Huda, Nugroho, and Sunindijo (2022), many construction projects still place safety

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aspects as a mere administrative burden and not part of strategic management. In fact, in practice, OHS aspects are often put on the back burner after achieving project time and cost targets, resulting in greater and uncontrollable work risks.

In addition to the weak implementation of regulations and supervision, the lack of education and training on OHS has also contributed to the worsening of work safety conditions in the field. Pashya, Rakhmat, and Fansuri (2024) revealed that building a safety culture cannot be done partially, but must involve all stakeholders and be accompanied by long-term commitment. Efforts to increase the effectiveness of the OHS system can also be supported through digital technology. The use of Building Information Modeling (BIM), Internet of Things (IoT), wearable sensors, and Virtual Reality (VR) has begun to be applied in construction projects to support training, simulation, and real-time monitoring of work safety (Faisal & Fansuri, 2023; Latief, Machfudiyanto, Rachmawati, Kim, & Laksono, 2023). This is important considering that most supervision in the field is still done manually, which has proven to be less efficient and often does not cover all workers equally (Nurfirmansyah & Dijaya, 2022).

Thus, effective OHS implementation is not only determined by existing regulations, but also highly dependent on work culture, managerial leadership, supporting technology, and the collective awareness of all project actors. Improving the safety system in construction projects needs to be done thoroughly to not only reduce the number of work accidents, but also improve the quality, efficiency and sustainability of construction projects in Indonesia.

METHOD

This research uses a literature study approach with the aim of collecting, analyzing and comparing data from various journals. The data collected is obtained from journals with a period of the last 5 years, namely from 2020-2024, to obtain information related to occupational safety and health problems that occur in construction projects. Based on

the journal, it will be analyzed with regard to problems, problem factors and the impact of problems on workers, companies and project sustainability.

RESULT

Based on an analysis of 15 journals with a period of 5 years and indexed by Scopus or Sinta. To gain a deeper understanding of the practices and barriers to OHS implementation in the construction sector in Indonesia, each article was analyzed based on its focus of study, approach to OHS issues, and key impacts or outcomes of the research. The purpose of this analysis was to identify emerging patterns, key challenges, and strategies that have proven effective in strengthening OHS implementation in the field. A summary of the study results can be seen in Table 1 below:

Table 1. Results of Research Analysis from 2020 to 2024 (Recent Years)

No	Author (Year)	Main Focus	K3 Approach/Issues	Key Implications
1	Febry Handayani, Lendra, Veronica Happy (2024)	The influence of K3 policies on worker performance	K3 protocol during COVID- 19, policy implementation	K3 policies encourage worker motivation and productivity
2	Harris Sinaga, Sondang P. Napitupulu, Pandapotan Sihombing (2022)	The relationship between K3 and project success	Occupational health, occupational safety, the role of project managers	K3 influences the success of a project in terms of quality and time.

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No	Author (Year)	Main Focus	K3 Approach/Issues	Key Implications
3	Fatimah, Sodri, Hamzah (2023)	The impact of the COVID-19 pandemic on the implementation of K3	Changes in worker behavior, health protocols	COVID-19 raises awareness of the importance of K3
4	Andi, H. Sumali, HR Limansantoso (2022)	Contractor leadership towards worker safety behavior	Worker compliance, supervision, safety motivation	Contractor leadership reduces unsafe acts
5	Kadir, Deni Lestari, Benny Tjahjono, Jose C. Alfaro, Syamsul Huda, J. Adhi Nugroho, Sidqi Sunindijo (2022)	Safety climate analysis in Indonesian construction	Safety culture, management commitment, communication	A strong safety climate improves project safety performance.
6	Desiderius V. Indrayana, Krishna S. Pribadi (2023)	The role of project owners in occupational safety	Leadership maturity model, owner responsibility	Project owners play a direct role in safety outcomes
7	Catra Rahma Pashya, Rino Rakhmat, Hamzah Fansuri (2024)	Total safety culture in IKN projects	Total safety culture, organizational and behavioral factors	Comprehensive culture strengthens the national K3 system

No	Author (Year)	Main Focus	K3 Approach/Issues	Key Implications
8	Yusuf Latief, Titi Sari, Rossy A. Machfudiyanto, Nurul Rachmawati, Sunkuk Kim, Naufal Budi Laksono (2023)	Implementation of design for safety (DfS)	Designer role, contract documents, policies	DfS effectively reduces risks from the planning stage
9	Farhan Saputra, M. Rizky Mahaputra (2022)	The influence of work environment and discipline on K3	Physical work environment, work discipline	Environment and discipline influence occupational safety and health
10	Noeroel Widayati (2025)	Occupational hazards and their impact in	Cross-sector physical & psychological	A multidimensional and collaborative approach is

		various industries	risks, K3 technology	needed for risk mitigation.
11	Sadeghi et al. (2025)	Systematic review of occupational safety and health (OHS) in modular construction (MiC)	K3 risks in modular construction, digital technologies for risk mitigation, hazard identification and control	MiC offers efficiency benefits but also poses specific OHS risks such as falls, heavy lifting injuries, and electrocution. Administrative control approaches are dominant.
12	Bourahla et al. (2024)	The relationship between project management and OHS management in achieving social sustainability in construction	Integration of K3 management in construction projects, legal compliance, training, risk assessment and safety equipment	Effective OHS improves project performance (productivity, reputation, safety). Integration of OHS into the overall project management process is recommended.
13	Maulani et al. (2021)	Readiness of construction service providers in implementing	Evaluation of the readiness of human resources and project facilities for the	Human resource readiness is quite good (66.66%) and facility readiness is moderate (60%).

		K3 during the Covid-19 pandemic in West Sumatra	Covid-19 K3 protocol based on INMEN PUPR No.2/2020	Systematic improvements are needed so that the protocol can be implemented optimally.
14	Carma et al. (2024)	The influence of work compliance on occupational safety and health at PT. Mitramas Muda Mandiri	Correlation between work compliance (absenteeism, rule compliance, ethics) and implementation of K3	Work compliance has been proven to have a significant impact on K3. There is a need to improve the culture of discipline and awareness to prevent work accidents.
15	The Queen & Cahyadi (2024)	Analysis of the implementation of K3 on the construction project of PT. XYZ in Gresik	Evaluation of causes of work accidents: lack of understanding of K3, PPE not used, lack of K3 socialization	Educational strategies, increased use of PPE, and enforcement of K3 SOPs are needed. Management involvement is important to build a safe work culture.

The table shows that the focus of OHS-related studies in the past five years has been very diverse, covering aspects of project leadership, safety management, to the utilization of technology in the implementation of OHS systems in the construction sector. Despite different research methods and approaches, all of the literature reviewed emphasizes the importance of building a strong safety culture, complying with regulatory provisions, and applying technological innovations as an effort to increase the effectiveness of OHS implementation at work sites. In addition, the majority of the journals analyzed have been indexed in SINTA and reputable international

journals, indicating that the topic of occupational safety has become a strategic issue both in the academic world and in the practice of the construction industry in Indonesia.

DISCUSSION

Occupational Safety and Health (OSH) is a crucial aspect in the implementation of construction projects, considering the high potential risk of accidents that can affect worker safety, project continuity, and cause financial losses. Maulani, Hidayat, and Ophiyandri (2021) stated that OSH not only focuses on preventing workplace accidents at construction sites but also on preventing occupational diseases. Occupational Safety and Health (OSH) has an impact on employee performance (Safirazzahra & Setiawan, 2024). Human resource performance is one of the key determinants of an organization's or company's success (Safirazzahra & Setiawan, 2024).

Based on a literature review of various journals, government reports, and previous studies, several important findings have emerged regarding the development and challenges of Occupational Safety and Health (OSH) in the context of construction projects in Indonesia. Stakeholders involved in these projects need to build greater awareness of safety issues by implementing effective strategies to reduce the risk of workplace accidents (Indrayana et al., 2023).

Through the analysis of 10 reviewed journals, it was found that Occupational Safety and Health (OSH) issues in the construction sector remain a highly significant concern. Prameswari & Cahyadi (2024) stated that OSH protection is still often neglected in Indonesia. Construction work, which involves heights, noise, air pollution, and heavy equipment, can lead to serious OSH problems for workers (Carma, Suheman, & Khalida, 2024). The impact of work-related accidents resulting from inadequate OSH implementation is felt not only by employees but also by the general public or business customers (Prameswari & Cahyadi, 2024).

The high rate of work-related accidents in this sector indicates that the Occupational Safety and Health (OSH) system is not yet functioning optimally. In a study conducted by Pashya, Rakhmat, and Fansuri

(2024), 36 factors were identified that contribute to the development of a comprehensive safety culture within projects. These include leadership, competence, commitment, regulations, project scope, resources, supervision, and training. A lack of awareness of OSH often leads workers to ignore the use of Personal Protective Equipment (PPE) provided, compounded by limited understanding of the risks and consequences that may arise from non-compliance with OSH regulations (Prameswari & Cahyadi, 2024).

The active role and high performance of the workforce as human resources in implementing occupational safety and health policies have a significant impact on the success of construction projects (Sinaga et al., 2022). Various studies have indicated that safety aspects are often not yet an ingrained part of the workplace culture. For example, Indrayana and Pribadi (2023) stated that the approach to occupational safety still tends to be reactive rather than proactive. This view is supported by findings from Faisal and Fansuri (2023), who explained that human factors—such as procedural violations, misperceptions of hazards, unsafe working conditions, and lack of supervision—are common causes of work-related accidents that continue to occur.

In addition to cultural and attitudinal issues, there are also challenges in implementing an effective safety system on site. One of the main obstacles is the weak leadership role of project stakeholders, including both contractors and owners. According to Andi, Sumali, and Limansantoso (2022), the failure to develop safe behavior among workers often stems from a lack of encouragement and supervision from direct superiors. Furthermore, Desiderius V. Indrayana and Krishna S. Pribadi (2023) stated that the involvement of project owners in safety matters remains very limited, even though they should play a role in strategic decision-making and overseeing the safety system.

Other challenges include the low competency of human resources in occupational safety and health (OSH), the lack of regular training, and the conflict between production targets and safety implementation at the work site. Workers are able to work harder, more efficiently, and take

greater responsibility in the workplace when driven and motivated by safety leadership (Andi, Sumali, & Limansantoso, 2022). Project owners can increase awareness and foster a culture of safety as part of their responsibility by becoming involved in all stages of the project, which is one of the best approaches in construction in Indonesia (Indrayana et al, 2023). The quality of construction managers greatly determines the success of a construction project (Sinaga et al, 2022). Contractors implement three dimensions of safety leadership: setting goals, policies, and safety procedures, and emphasizing their enforcement in construction projects (Andi, Sumali, & Limansantoso, 2022). Their study also shows that contractors influence workers' compliance and participation in construction safety practices.

In response to the challenges of implementing occupational safety and health (OSH), various solutions have been proposed in the literature. Prameswari & Cahyadi (2024) suggested several measures, including effective dissemination of the importance of OSH, strict implementation of Standard Operating Procedures (SOPs), adequate and clear placement of safety signs in the work area, strict enforcement of warning letters or fines to violators as a way to emphasize the importance of complying with OSH regulations. One of the key approaches is the application of the Design for Safety (DfS) principle, which integrates safety into the project design process. Latif et al. (2023) emphasized the importance of incorporating risk considerations from the early stages of design to prevent accidents in the future. In addition, the development of a comprehensive safety culture involving all elements of the organization has also become a critical focus.

Advancements in digital technology have made significant contributions to supporting the implementation of occupational safety and health (OSH) in the construction sector. Faisal and Fansuri (2023) explained that various technologies such as Virtual Reality (VR), Augmented Reality (AR), Building Information Modeling (BIM), the Internet of Things (IoT), and wearable devices can be utilized to strengthen safety management systems on-site. These technologies offer practical solutions through simulation-based training, real-time monitoring of

workers' conditions, and the ability to quickly and accurately identify potential hazards.

The implementation of technology-based approaches is becoming increasingly relevant, as other research findings indicate that manual methods of worker supervision are considered inefficient in ensuring compliance with occupational safety regulations. As stated by Nurfirmansyah and Dijaya (2022), there is a need for tools that can automatically verify the use of personal protective equipment (PPE) to enhance the effectiveness of supervision. In line with this, previous studies have also explored the utilization of digital technologies to support construction safety, including the use of VR, AR, CNN, BIM, drones (Unmanned Aerial Vehicles), two-dimensional motion graphics, and Internet of Things (IoT)-based sensors in various construction projects in Indonesia (Faisal & Fansuri, 2023). However, although these technologies have contributed to improving aspects of occupational safety, their implementation has not yet addressed all dimensions of safety, such as protection of the communities surrounding the project and environmental impacts. Therefore, further development is needed to ensure that the integration of technology into construction safety systems can be more comprehensive and sustainable.

CONCLUSION

The results of the literature review indicate that the implementation of Occupational Safety and Health (OSH) in Indonesia's construction sector still faces various challenges. The main issues include the lack of effective leadership roles in project management, low worker compliance with safety standards, and the underutilization of technology to support the implementation of OSH systems. Workplace safety is often regarded merely as an administrative obligation rather than an essential part of strategic project planning. To improve the quality of OSH implementation, it is necessary to integrate safety-oriented design principles from the early stages of the project, fully apply digital technologies, and strengthen a safety culture involving all project

elements. These findings are expected to serve as a foundation for formulating policies, training, and developing more effective OSH management systems to support the creation of a safe, healthy, and sustainable working environment.

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