IJCSS 6 (1) (2025) Pages:. 293-300

Journal homepage: http://pcijournal.org/index.php/ijcss

International Journal of Cultural and Social Science

Published: Pena Cendekia Insani

RISK MANAGEMENT ANALYSIS OF OCCUPATIONAL HEALTH AND SAFETY IN LOADING AND UNLOADING PROCESSES ON PASSENGER SHIPS ALONG THE KIJANG–SUNGAI GUNTUNG ROUTE (CASE STUDY ON KM SABUK NUSANTARA 110)

Embun Febryanti Panggabean[1], Juliana Nasution [2]

[1,2]State Islamic University of North Sumatra, Medan, Indonesia

Article Info

Keywords:

Risk Management, Occupational Safety and Health, Passenger Ships, Loading and Unloading, Personal Protective Equipment (PPE).

ABSTRACT

This study aims to analyze the Occupational Safety and Health (OHS) risk management in the loading and unloading process on KM Sabuk Nusantara 110. The main focus of this study is to identify potential hazards, assess the level of risk, and evaluate the effectiveness of implementing safety procedures on the ship. Using qualitative methods, data were collected through in-depth interviews with chief engineers and stevedoring workers and related literature reviews. The results of the study identified several major potential hazards, such as the breaking of the crane steel rope due to excess load capacity, the risk of slipping due to the slippery ship floor, and the lack of worker awareness in using personal protective equipment (PPE). Although there have been no significant work accidents, the implementation of the OHS SOP still has weaknesses, especially in supervision and routine training for workers. Therefore, this study recommends increasing supervision of the use of PPE, preventive maintenance of equipment, and holding periodic training to increase worker awareness and compliance with safety procedures. These findings are expected to be the basis for formulating more effective occupational safety policies in the maritime sector.

Corresponding Author:

Embun Febryanti Panggabean
State Islamic University of North Sumatra
embun220224@gmail.com

1. INTRODUCTION

KM Sabuk Nusantara 110 is a government-owned pioneer vessel that continues to operate along the sea toll route, serving areas such as Tembilahan, Sungai Guntung, Kijang, and Tanjung Pinang. This vessel plays a vital role in supporting inter-island connectivity, as well as facilitating the distribution of logistics and the mobility of people in regions with limited access to commercial maritime transportation. With a passenger capacity of up to 800 individuals and a cargo load capacity of 50 tons, KM Sabuk Nusantara 110 is equipped with facilities such as air-conditioned cabins, a prayer room, toilets, economy and VIP seating, and a loading crane, making it a backbone of pioneer maritime services. However, from a technical perspective, KM Sabuk Nusantara 110 is considered an aging vessel, indicating that several structural and functional components may be experiencing performance degradation.

The aging condition of the vessel cannot be separated from the increasing occupational safety and health (OSH) risks faced by the crew and loading/unloading workers. A study on OSH risk management on KM Sabuk Nusantara 110 reveals several significant hazards, including the potential for crane wire rope failure due to

overloading, workers slipping on the ship's deck due to slippery surfaces, and damage to the fiber boxes used for transporting fish from local fishermen. These problems are exacerbated by inadequate supervision of personal protective equipment (PPE) usage and the absence of regular training for workers, particularly port laborers. The vessel's age indirectly increases the likelihood of equipment failure, especially in mechanical systems such as cranes and hydraulics, which are crucial during cargo handling operations. Without adequate preventive maintenance, such failures may lead to serious incidents affecting both individual safety and the overall operational integrity of the vessel. Therefore, raising worker awareness, ensuring strict supervision of OSH standard operating procedures (SOPs), and implementing technical renewal or refurbishment of the vessel are urgent priorities to ensure safe and efficient ongoing operations.

According to Nasution (2021), risk management in occupational safety and health is a systematic approach aimed at identifying, assessing, and controlling risks to reduce the likelihood of work-related accidents and illnesses. In the maritime industry, especially in ship loading and unloading activities, implementing risk management is essential to prevent workplace accidents and enhance worker safety.

In the context of ship cargo operations, several major risks that must be addressed include the snapping of steel ropes or slings during lifting, slipping on slippery decks due to oil or seawater spills, and accidents resulting from a lack of worker awareness of safety procedures (Rosmadi, 2023). Port environments often feature uneven, slippery work areas filled with heavy equipment, which increase the risk of accidents. Moreover, weather conditions such as heavy rain and strong winds can elevate the level of risk, particularly when workers must handle goods in wet and slippery conditions (Sutanto, 2020). Many occupational accidents are caused by internal factors related to worker behavior and condition. Prasetyo (2020) argues that human error often stems from insufficient training, fatigue, and high psychological stress. Hasty decision-making or lack of understanding of safety procedures can result in critical operational errors. In OSH contexts, fatigue management is a crucial factor that requires special attention. Hariyanto (2022) explains that worker fatigue, particularly in the maritime industry, directly increases the risk of workplace accidents. Excessive workload, long working hours, and harsh environmental conditions can lead to decreased concentration as well as diminished physical and mental performance. Therefore, regular training and increased supervision of the implementation of safety procedures are needed to reduce accidents caused by human factors (Rahman & Setiawan, 2021).

According to Sutrisno (2021), in the maritime industry, the hazard identification process is a critical first step in preventing occupational accidents. This stage involves systematic observation of the operational environment to detect potential risks. Physical aspects such as slippery deck conditions, the use of heavy cargo equipment, and extreme weather conditions are key factors that must be identified early. Recognizing these risks allows companies to design specific mitigation strategies for each identified hazard. The HIRA (Hazard Identification and Risk Assessment) method emphasizes the importance of classifying and evaluating each hazard based on the severity and likelihood of incident occurrence. This process includes comprehensive data collection and in-depth analysis of each potential risk. As a result, not only physical aspects are considered, but also ergonomic elements such as fatigue from long working hours. This approach enables the development of risk control priorities so that resources can be effectively allocated to address the most critical hazards. The risk control hierarchy, as outlined by Setiawan (2020), organizes risk management steps in order of effectiveness, from the most to the least effective. The first step is elimination, which involves removing the hazard entirely from the work environment. If elimination is not feasible, the next step is substitution, which involves replacing risky processes or equipment with safer alternatives.

In the context of OSH risk management during cargo handling on passenger vessels, a systematic approach is vital. According to Dharma, Marliyah, and Syarbaini (2023), the implementation of the ISO 31000:2018 risk management framework within Islamic educational institutions in Indonesia demonstrates that integrating risk management into organizational governance can enhance decision-making effectiveness and risk mitigation. This approach emphasizes the importance of proactive risk identification, comprehensive risk assessment, and the implementation of appropriate controls to reduce both the likelihood and impact of risks. When applied to the operation of passenger vessels, these principles help identify potential hazards during cargo handling processes and inform the design of effective preventive measures.

Waizul Qarni (2022) states that the success of OSH implementation is greatly influenced by social communication and the role of informal leaders in the workplace. In the heterogeneous working environment of ports, informal communication and local culture often prove more effective in instilling safety discipline than formal structural commands. Occupational safety in ship loading and unloading is a shared responsibility between companies and workers. With the proper strategies, such as routine training, improved compliance with OSH procedures, and the use of technology in risk management, workplace accident rates can be significantly reduced. This study aims to identify potential hazards in the cargo handling process, assess the levels of associated risks, and provide effective control recommendations. Further research on the effectiveness of OSH implementation in passenger vessel operations may offer deeper insights for the development of improved occupational safety policies in the future.

2. RESEARCH METHODS

This study employed a qualitative approach by conducting interviews with two informants: Dimas Reza Pratama, serving as the chief engineer, and Muhammad Hendratama, a cargo handling worker on board KM Sabuk Nusantara 110, who at the time of the interview was stationed in Pontianak. The interviews were conducted on February 16 and 27, 2025, to gain in-depth insights into the practices and challenges of implementing occupational safety and health (OSH) risk management on KM Sabuk Nusantara 110. A qualitative approach was chosen as it allows the researcher to understand perceptions, experiences, and on-site dynamics through in-depth interviews and literature review.

Data collection techniques included in-depth, semi-structured interviews with relevant stakeholders, such as the chief engineer and cargo handling workers. The interview guide was structured around aspects such as hazard identification, SOP implementation, use of personal protective equipment (PPE), and incident handling. The interviews were recorded (with the participants' consent), and the transcripts were analyzed to identify key themes related to OSH risk management. Secondary data collection through literature review was also conducted by searching for relevant journals, books, and scientific publications—especially those related to hazard identification, the hierarchy of risk control, human error theory, and fatigue management. The literature used was sourced from national and international publications, published no earlier than 2020, to ensure the relevance and currency of the data and theoretical framework.

Data analysis techniques included thematic analysis and the Hazard Identification, Risk Assessment, and Risk Control (HIRARC) method. This process involved data coding, pattern identification, and drawing conclusions that connected interview findings to the theoretical framework. It included hazard identification across various aspects, risk assessment to determine the severity and potential impact of hazards on workers, and risk control measures. Data from the literature review were used to support and contrast field findings, resulting in a comprehensive understanding of current practices and potential improvements in OSH risk management.

3. RESULT AND ANALYSIS

Occupational Safety and Health (OSH) Risk Identification

The researcher posed several questions regarding the identification of occupational safety and health risks. The following are the questions asked along with the interview responses from the informants.

What are the potential hazards that frequently occur during the loading and unloading process on this vessel?

Dimas: *"One of the potential hazards during the loading and unloading process on the vessel is the snapping of the steel wire rope on the crane due to overloading, for example."*

Hendra: *"There are several hazards during loading and unloading, for instance, workers slipping on the ship's deck because they are not wearing safety shoes."*

During loading and unloading activities on board the vessel, several types of occupational accidents may occur. According to Dimas Reza Pratama, one of the major risks is the snapping of the crane's steel wire rope due to exceeding its load capacity. This can cause the lifted cargo to fall and potentially injure workers nearby. Muhammad Hendratama added that another common hazard is workers slipping on the ship's deck, particularly when they are not equipped with safety shoes. The slippery surface of the deck, especially when wet, is one of the main contributing factors to such incidents.

Have there been any work accidents during your time working here? If so, what were the causes?

Dimas & Hendra: *"During our time working on KM Sabuk Nusantara 110, no accidents have occurred."*

Both informants stated that although there are numerous potential hazards present, there have been no serious work-related accidents on board KM Sabuk Nusantara 110 to date.

How is the working environment during the loading and unloading process? Are there any factors that increase the risk of accidents or occupational illnesses?

Hendra: *"There definitely are. For instance, when we carry fiber boxes filled with fish from fishermen, not all of these boxes are in good condition—some are cracked. This could lead to the box breaking when lifted by the crane, potentially falling on workers underneath. Additionally, water leaking from the boxes often drips onto the deck, which is slippery due to the metal surface coated with oil-based paint."*

Hendratama emphasized that some of the fiber boxes used to transport fish are occasionally damaged or cracked. When such boxes are lifted using a crane, they may break and fall on workers below. Moreover, water leaking from these boxes often drips onto the ship's deck, further increasing slipperiness and the risk of workers slipping, given the deck's steel surface and oil-based paint coating.

OSH Policies and Procedures

The following are questions related to Occupational Safety and Health (OSH) policies and procedures, along with the responses obtained from the interviews.

Does the company have a policy or Standard Operating Procedure (SOP) related to OSH during the loading and unloading process?

Dimas: *"Of course, every company is required to have an OSH-related SOP. Therefore, everyone working on board is equipped with personal protective equipment (PPE) such as wearpacks, safety shoes, safety helmets, work gloves, etc."*

Every company is required to implement work safety procedures that must be followed by all workers. Dimas emphasized that the company has implemented a mandatory policy on the use of Personal Protective Equipment (PPE) for all workers. The PPE provided includes wearpack uniforms, safety shoes, safety helmets, and work gloves.

How is the implementation of OSH procedures on KM Sabuk Nusantara 110? Do all workers comply with them?

Hendra: *"KM Sabuk Nusantara 110 strictly adheres to the SOP."*

According to Hendratama, KM Sabuk Nusantara 110 strictly complies with the Standard Operating Procedures (SOP) regarding workplace safety.

What are the main obstacles in implementing safety procedures on this ship?

Dimas: *"Sometimes the issue lies with the workers themselves, who are negligent about their own safety."*

Although the SOPs have been implemented properly, one of the main challenges in enforcing OSH is the negligence of the workers themselves. Many workers are undisciplined in following safety regulations and often disregard existing risks.

OSH Facilities and Equipment

Does the company provide adequate personal protective equipment (PPE)? If so, is its use monitored?

Dimas: *"The company provides sufficient PPE for work activities, but its use is not well supervised."*

Hendra: *"The provision of PPE is adequate, but its use is poorly monitored."*

In addition to policies and procedures, the availability of OSH facilities is also a critical factor in ensuring worker safety. Dimas stated that the company has provided sufficient PPE; however, supervision of its use is still lacking. Hendratama shared a similar view, noting that although the PPE supply is adequate, some workers are reluctant to use it, and supervision should be improved.

Are there health facilities on board to respond to work-related accidents? What is the procedure if an incident occurs?

Dimas: *"There are health facilities on board, and the second officer is responsible for knowing the procedure in case of an incident."*

The vessel is equipped with health facilities to handle workplace accidents, and the incident response procedures are known by the second officer.

OSH Training and Awareness

Do workers receive regular training related to OSH? How frequently is the training conducted?

Dimas: *"It seems that workers do not receive training, as the unloading activities are carried out by port laborers at each port."*

Hendra: *"No regular training is conducted on board."*

Worker awareness regarding OSH remains a major issue on the ship. Dimas explained that regular OSH training is not provided to crew members because unloading activities are primarily performed by port laborers. Hendratama confirmed that no routine OSH training is given to the workers on board.

What is the level of worker awareness regarding the importance of occupational safety and health?

Dimas: *"The level of awareness is still very low."*

Hendra: *"Worker awareness is poor; they are sometimes negligent about their own safety and health."*

According to Dimas, workers' awareness of occupational safety is still very low. Hendratama also noted that many workers are careless and lack concern for their own safety, even though the risk of accidents is high.

Preventive and Improvement Measures

In your opinion, what measures can be taken to improve OSH risk management on KM Sabuk Nusantara 110?

Dimas: *"Improving OSH management can be done through regular maintenance of equipment, such as checking the hydraulic oil volume and applying grease to the steel wire ropes."*

Hendra: *"The most important thing is to improve self-awareness among the human resources."*

Several measures are needed to improve workplace safety on the vessel. Dimas suggested that more attention should be given to the routine maintenance of equipment, such as checking hydraulic oil levels and applying grease to steel ropes. Hendratama stressed that enhancing workers' awareness of safety is the most essential step.

Are there any recommendations or suggestions from workers to the management regarding safety improvements on board?

Dimas & Hendra: *"There should be stricter supervision on the use of PPE."*

Stricter monitoring of PPE usage is needed to ensure that workers comply with safety procedures and use the equipment as required.

Table 1. Occupational Safety and Health (OSH) Risk Analysis on KM Sabuk Nusantara 110

No.	Potential Hazards	Probability (1–5) / Severity (1–5) / Risk Level (L/M/H)	Control Measures
1.	Breaking of crane wire rope	4 / 5 / H	Routine inspection of wire rope, load capacity limitation, crane operation training
2.	Slipping on the ship's deck	3 / 4 / M	Use of safety shoes, regular deck cleaning, installation of slippery floor warning signs
3.	Damage to fiber box during crane lifting	3 / 5 / H	Pre-loading inspection of box condition, use of standard-compliant boxes
4.	Inadequate use of Personal Protective Equipment (PPE)	4 / 4 / H	Strict supervision of PPE usage, penalties for non-compliant workers
5	Worker fatigue	4 / 3 / M	Work shift arrangement, sufficient rest periods, task rotation among workers
6.	Extreme weather (rain, strong winds)	3 / 5 / H	Weather monitoring prior to loading/unloading, work schedule adjustment in unsafe conditions
7.	Lack of Occupational Safety and Health (OSH) training	4 / 4 / H	Regular training on safety procedures, emergency response simulations
8.	Weak supervision of SOP implementation	3 / 3 / M	Periodic internal audits, strengthening the role of safety supervisors
9.	Failure of work equipment	4 / 5 / H	Routine preventive maintenance, daily equipment checks before use

10.	Unclear emergency response procedures	3 / 5 / H	Development of emergency response protocols, evacuation drills for workers

Description:

a. Probability: 1 = Very Rare, 2 = Rare, 3 = Possible, 4 = Frequent, 5 = Very Frequent
b. Severity: 1 = Minor, 2 = Moderate, 3 = Serious, 4 = Very Serious, 5 = Fatal
c. Risk Level: L = Low, M = Medium, H = High

Based on the above analysis, several major hazards are identified as having a high level of risk (H), particularly those related to crane wire rope failure, equipment malfunction, lack of supervision, and low worker awareness. By implementing appropriate control measures, the risk of accidents can be minimized and a safer working environment can be established. Juliana Nasution and Budi Dharma (2023), in their research on the maturity level of risk management in Islamic universities in Indonesia, emphasize the importance of developing a proactive organizational culture toward risk. They argue that successful risk management does not solely depend on formal policies but also requires the active involvement of all organizational elements in systematically identifying and managing risks. This approach is highly relevant in the context of passenger ship operations, where the involvement of all crew members and management in identifying and mitigating OSH (Occupational Safety and Health) risks is crucial to prevent workplace accidents. The following are suggested risk mitigation measures:

1. Crane wire rope failure can be mitigated through routine maintenance, including lubrication, periodic visual and functional inspections by competent technicians, replacement of wire ropes based on schedule or visible damage, strict load checks before each lift using calibrated instruments, and comprehensive operator training. This training should cover proper operation, understanding of load capacity limits, and emergency procedures in case of malfunction. These measures are essential to ensure that the crane operates within safe conditions and does not exceed its structural limits, which could lead to failure and potentially fatal accidents. According to Nurbaiti (2022), the use of information technology in sensor-based and integrated database monitoring systems allows for faster decision-making during emergencies. A digital-based management information system can also enable early detection of potential equipment damage and real-time violations of SOPs by workers.
2. The risk of slipping on the ship's deck due to slippery surfaces can be reduced by regularly cleaning the deck to remove oil, water, or other hazardous materials, and enforcing the mandatory use of anti-slip safety shoes (SRC standard) for all workers and visitors on deck areas. Additionally, placing warning signs in slippery areas is important to raise awareness and encourage caution.
3. To prevent hazards from damaged fiber boxes, it is essential to visually and structurally inspect each box before lifting to ensure there are no cracks, deformations, or other forms of damage that compromise its integrity. The use of standard-compliant boxes appropriate to the type of cargo and safe lifting methods must be enforced to prevent failures during loading and unloading.
4. The lack of PPE usage should be addressed by increasing field supervision by supervisors and safety officers, continuous awareness campaigns on the benefits and importance of PPE for personal protection, and the enforcement of strict and consistent sanctions for non-compliance. Providing standardized and comfortable PPE is also a company responsibility. Juliana Nasution (2021) emphasized the importance of integrating risk management principles into every phase of operational planning, including budgeting and logistics management. In the context of passenger ships, this includes planning for the procurement and maintenance of loading/unloading equipment and the proportional allocation of PPE.
5. Worker fatigue risks can be mitigated by implementing fair working hours in accordance with labor regulations, allowing sufficient rest periods between tasks to restore energy and concentration, and rotating job assignments periodically to reduce prolonged physical or mental strain. Stress management and the promotion of healthy lifestyles should also be considered.
6. Extreme weather conditions must be anticipated through daily monitoring and short-term weather forecasts from reliable sources before commencing loading and unloading operations. Adjusting work schedules or temporarily halting activities during unsafe weather conditions (e.g., heavy rain, strong winds, high waves) is crucial to avoid forcing operations under hazardous conditions.
7. The absence of OSH training can be resolved by conducting regular training sessions covering hazard identification, risk assessment, risk control measures, safety procedures, proper use of PPE, and first aid. Regular emergency response drills help workers understand what actions to take in dangerous situations. Short safety briefings (toolbox meetings) before starting work activities are also effective in reminding workers of potential risks and preventive measures.

8. Weak supervision of SOP compliance requires regularly scheduled internal audits to evaluate adherence to workplace safety procedures. Appointing competent safety officers with clear roles and responsibilities is crucial to ensure all procedures are carried out according to standards, issue warnings for violations, and report potential hazards or non-conformities.
9. Equipment failure can be prevented through consistent preventive maintenance, including daily inspections before use to ensure all components function properly, routine lubrication, scheduled replacement of worn or damaged parts, and detailed maintenance record-keeping to monitor conditions and identify potential problems early.
10. To address unclear emergency response procedures, a detailed and easily understandable evacuation protocol must be established and communicated to all workers. This includes designated evacuation routes, assembly points, and emergency communication procedures. Regular evacuation drills are essential to ensure all workers know what actions to take in emergencies such as fire, hazardous material spills, or other workplace incidents.

4. CONCLUSION

Based on interviews with Muhammad Hendratama (Second Engineer) and Dimas Reza Pratama (Chief Engineer), the implementation of Occupational Safety and Health (OSH) on the KM Sabuk Nusantara 110 is generally adequate but still has several weaknesses that need to be addressed. In general, the vessel has implemented safety procedures by providing and requiring the use of Personal Protective Equipment (PPE) such as safety shoes, safety helmets, coveralls, and work gloves. The ship also complies with OSH Standard Operating Procedures (SOPs) and is equipped with medical facilities to handle work-related incidents. So far, no accidents have occurred during the loading and unloading process.

However, there are several potential hazards that must remain under close watch, such as the possibility of crane wire rope breakage due to overloading, which may cause falling objects, as well as the risk of slipping, particularly during rainy conditions or when water from fish cargo drips onto the deck, making it slippery. The biggest challenge in OSH implementation is the lack of worker awareness regarding workplace safety, which often leads to negligence in following proper procedures.

Although the safety equipment and facilities are considered sufficient, there are still areas that require improvement. Supervision over PPE usage remains weak, resulting in many workers not using them consistently. The absence of regular training is also a problem, as workers do not receive periodic safety briefings. Workers' awareness of occupational safety is still low, which increases the risk of accidents in the workplace.

To improve workplace safety aboard the KM Sabuk Nusantara 110, it is necessary to raise workers' awareness of the importance of OSH through socialization or brief training sessions before work begins. Supervision of PPE usage should be strengthened to encourage greater discipline among workers in protecting themselves. In addition, routine maintenance of work equipment—such as checking hydraulic oil and applying grease to wire ropes—should be conducted regularly to minimize the risk of equipment failure-related accidents. Safety management should also be reinforced by ensuring that all workers fully understand and properly follow safety procedures.

Overall, while OSH implementation on KM Sabuk Nusantara 110 is relatively sound, improvements are still needed in supervision, worker awareness, and regular training in order to ensure better workplace safety and minimize the potential for accidents.

5. REFERENCES

[1] Chen, Y., & Wong, P. (2022). Technological Innovations in Occupational Health and Safety: Maritime Applications. Journal of Safety Research, 45(5), 323–340.

[2] Dharma, B., Marliyah, & Syarbaini, A. M. B. (2023). The Maturity of Risk Management in Indonesian Islamic Universities. *Ilomata International Journal of Management*, 5(3), 45–58.

[3] Garcia, L., & Martinez, F. (2021). Occupational Safety in Maritime Transport: Best Practices and Innovations. Safety Science, 134, 105–120.

[4] Hariyanto, E. (2022). Manajemen Kelelahan dalam Operasional Maritim: Tantangan dan Solusi. Jurnal Kesehatan Kerja, 10(3), 102–115.

[5] Haryanto, I. (2021). Peran Pelatihan dan Budaya Keselamatan dalam Mencegah Kecelakaan Kerja di Kapal. Jurnal Pendidikan K3, 5(1), 33–47.
[6] Johnson, M. (2021). The Role of Preventive Maintenance in Maritime Safety. International Journal of Industrial Ergonomics, 31(3), 210–225.
[7] Kumar, S., & Patel, R. (2020). Safety Management Systems in Shipping Industry: A Case Study. Journal of Marine Engineering and Technology, 22(1), 45–60.
[8] Kurniawan, F., & Dewi, L. (2021). Implementasi HIRA di Sektor Maritim Indonesia. Dalam K3 Maritim: Strategi dan Penerapan (hlm. 45–68). Jakarta: Penerbit K3 Nasional.
[9] Lee, J., & Park, S. (2022). Fatigue Management in Maritime Industries: Challenges and Interventions. Maritime Business Review, 14(2), 145–160.
[10] Li, H., & Zhang, Y. (2022). Risk Management in Maritime Operations: A Comprehensive Review. International Journal of Maritime Safety, 15(2), 150–170.
[11] Mulyadi, P. (2022). Strategi Peningkatan Keselamatan Kerja di Sektor Maritim Indonesia. Dalam Keselamatan Kerja Maritim: Teori dan Praktik (hlm. 78–95). Bandung: Penerbit Teknik Nusantara.
[12] Nasution, J. (2021). *Analisis Implementasi Pengawasan Ekspor Impor Barang*. Jurnal Ekonomi dan Manajemen UINSU, 5(1), 55–66.
[13] Nasution, J., & Dharma, B. (2023). The Maturity of Risk Management in Indonesian Islamic Universities. *Journal of Risk Management and Governance*, 5(2), 45–58.
[14] Nugroho, A. (2020). Peningkatan Kesadaran K3 di Lingkungan Maritim. Jurnal Ilmu K3 Indonesia, 7(1), 12–28.
[15] Prasetyo, D. (2020). Human Error Theory dalam Keselamatan Kerja di Sektor Maritim. Jurnal Manajemen Risiko, 5(1), 55–67.
[16] Qarni, W. (2022). Peran Komunikasi Sosial dalam Meningkatkan Disiplin Kerja di UKM Kreatif. Jurnal Pengembangan Masyarakat, 6(2), 100–113.
[17] Rahman, G., & Sari, M. (2021). SOP K3 dalam Operasional Kapal: Analisis Implementasi dan Kepatuhan. Jurnal Teknik Keselamatan, 9(4), 88–99.
[18] Rahmat, S., & Dwi, A. (2021). Evaluasi Sistem Pengawasan K3 di Kapal Penumpang. Jurnal Manajemen Keselamatan, 11(2), 95–110.
[19] Santoso, R. (2020). Analisis Kegagalan Peralatan pada Operasional Bongkar Muat. Jurnal Teknik Maritim, 6(3), 66–80.
[20] Setiawan, B. (2020). Hierarki Pengendalian Risiko dalam Operasional Bongkar Muat. Jurnal Keselamatan dan Kesehatan Kerja, 8(2), 78–89.
[21] Smith, J., & Brown, K. (2020). Advancements in Maritime Safety: Integrating Technology and Human Factors. Marine Policy, 110, 102–118.
[22] Sutrisno, A. (2021). Analisis Risiko K3 di Industri Maritim: Studi Kasus di Kapal Penumpang. Jurnal K3 Maritim Indonesia, 12(1), 34–45.
[23] Tan, W., & Liu, X. (2022). Risk Assessment Models for Maritime Operations: A Comparative Study. Journal of Risk Analysis, 38(4), 290–310.
[24] Wijaya, T., & Purnomo, H. (2021). Implementasi Teknologi Monitoring untuk Peningkatan K3 di Kapal. Jurnal Teknologi Keselamatan, 8(2), 50–65.
[25] Yustika, W., Siregar, N. T., Barus, V. A., Hasibuan, M. A. A., & Nurbaiti, N. (2023). Peranan Sistem Database Di Dalam Sistem Informasi Manajemen Pada UINSU (Universitas Islam Negeri Sumatera Utara). *Surplus: Jurnal Ekonomi dan Bisnis*, 1(2), 188–196.