



Hazard Observation Cards and Unsafe Actions Among Indonesian Vessel Crew

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Abstract

This study examined the implementation of Hazard Observation Cards (HOC) aboard a commercial vessel operating in Indonesian waters. The results showed that 158 unsafe actions and unsafe conditions were identified through 87 completed HOC forms during a three-month observation period. This mixed-methods case study involved 15 crew members from March to May 2024. Data were collected through HOC documentation, field observations, interviews, and safety records. Quantitative analysis used descriptive statistics and Cochran-Armitage trend tests, while qualitative data were analyzed thematically. Unsafe conditions (57.0%) were more frequent than unsafe actions (43.0%). Violations decreased significantly from 113 in March to 82 in May ($Z = -2.84$; $p = 0.004$). The most common unsafe practices involved the failure to use personal protective equipment and housekeeping deficiencies. Safe practices referred to compliance with maritime safety procedures, including the use of PPE, adherence to procedures, and hazard control measures. Interviews indicated that visible management responses increased crew safety awareness and participation. The findings suggest that HOC can function as a feasible participatory safety monitoring tool for small-crew maritime operations and may contribute to improved occupational safety performance.

Keywords

hazard observation card;
maritime safety;
occupational health;
unsafe actions;
unsafe conditions.

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Introduction

Maritime shipping transports over 80% of global trade, making maritime safety critical to worldwide economic stability (International Maritime Rescue Federation, n.d.). The International Maritime Organization has established comprehensive safety standards, including the Safety of Life at Sea Convention, to protect seafarers and vessels (Kuhn, 1930). Despite these regulatory frameworks, maritime accidents continue to pose significant risks, with contemporary challenges including piracy, equipment failures, and, most significantly, unsafe actions and unsafe conditions, which account for the majority of preventable accidents (Dominiguez, 2024). The European Maritime

Safety Agency identified that coordination failures, resource availability, workload, and fatigue contributed to 41% of maritime workplace incidents (Mišković et al., 2022), while other studies indicate that unsafe acts account for approximately 80% of maritime accidents (Lan et al., 2022). These statistics demonstrate that despite regulatory compliance, unsafe actions and conditions remain ongoing challenges requiring innovative occupational health interventions.

Recent maritime safety reports indicate that unsafe actions and unsafe conditions remain among the leading contributors to occupational accidents aboard commercial vessels. According to reports from the International Maritime Organization and the European Maritime Safety Agency, human-related operational failures, fatigue, poor safety compliance, and inadequate hazard control continue to contribute significantly to injuries, equipment damage, cargo loss, and environmental incidents in maritime operations. In Indonesia, maritime transportation activities also face persistent occupational safety challenges due to limited safety supervision, varying crew competencies, and inconsistent implementation of preventive safety programs across vessels. Unsafe acts such as failure to use personal protective equipment, procedural violations, and poor housekeeping practices frequently increase operational risks and reduce overall safety performance aboard vessels.

These conditions demonstrate the importance of proactive occupational safety interventions that identify hazards before accidents occur. Unlike reactive accident investigation approaches, preventive hazard observation systems allow continuous monitoring of unsafe behaviors and unsafe workplace conditions during routine maritime activities. Therefore, research examining the implementation of Hazard Observation Cards (HOC) in operational maritime settings is important to support evidence-based maritime safety management, particularly in developing-country maritime environments such as Indonesia.

Unsafe actions represent hazardous behaviors that deviate from established safe work procedures, while unsafe conditions refer to environmental and physical workplace characteristics that elevate accident risk independent of worker behaviors (Bancin, 2017; Shen et al., 2022). The maritime sector presents unique occupational health challenges due to complex, dynamic work environments that involve interactions among individuals, vessels, equipment, and unpredictable sea conditions. Human factors such as fatigue, stress, communication breakdowns, and inadequate safety culture further complicate prevention efforts (Dominguez-Péry et al., 2021). Traditional safety monitoring in the maritime industry relies primarily on periodic inspections and audits conducted by designated safety officers (Xu et al., 2023). However, this approach has significant limitations, including the inability to detect hazards between scheduled audits, the need for temporary behavior modification during inspections, and a focus on regulatory compliance rather than emerging risks. The dynamic nature of maritime environments, where risks escalate continuously based on weather, cargo operations, and crew fatigue, further challenges snapshot inspections that cannot capture temporal risk variability (Shen et al., 2022).

The Hazard Observation Card represents a proactive, participatory approach to workplace safety monitoring that empowers all crew members to document unsafe actions and conditions encountered during daily work (Djunaidi et al., 2021; S, 2018). Unlike traditional inspection methods, which rely on designated personnel to identify hazards, HOC democratizes safety responsibility, increases observation frequency, enhances crew safety awareness, and creates immediate feedback loops for prompt hazard resolution. Research demonstrates that HOC programs enhance safety resilience by fostering collective awareness and creating systematic hazard communication processes (Djunaidi et al., 2021; S, 2018). This approach is grounded in behavior-based safety theory, which posits that systematic observation and feedback regarding at-risk behaviors can reduce workplace injuries (Curcuruto et al., 2020) and aligns with Heinrich's accident causation theory, which emphasizes that addressing unsafe acts and conditions at early stages prevents progression to injuries (Forteza et al., 2022).

Previous maritime safety studies consistently demonstrate that unsafe human behavior remains a persistent issue across maritime operations. Studies conducted between 2021 and 2024 found that unsafe acts accounted for approximately 70–80% of operational maritime incidents, while organizational weaknesses and poor hazard management systems remained major contributing factors. Despite increasing international attention to maritime safety management systems, implementation challenges remain significant in developing maritime regions due to limited resources, varying regulatory enforcement, hierarchical reporting cultures, and inconsistent crew member safety participation. In Indonesia, maritime safety implementation is additionally influenced by operational pressures, workload demands, and practical limitations in continuous onboard hazard monitoring.

Despite growing evidence supporting HOC effectiveness, significant research gaps remain. Most existing HOC research has been conducted in land-based facilities with stable environments and substantial workforces (Curcuruto et al., 2020; Forteza et al., 2022). Limited research examines HOC implementation in specific regional maritime contexts or small-scale operations. Indonesian maritime operations occur within distinct regulatory frameworks, cultural contexts, and economic conditions that may differ substantially from settings where most research originates. Questions remain about optimal implementation in resource-constrained environments with small crews, hierarchical command structures, and harsh operational conditions. Understanding how HOC programs function in Indonesian waters provides valuable knowledge for regional occupational health practitioners and safety managers.

This case study pursues three primary objectives. First, to identify and categorize types and frequencies of unsafe actions and unsafe conditions observed among maritime crew during the three-month HOC implementation. Second, to assess temporal trends in safety violations and determine whether HOC implementation is associated with changes in observed unsafe behaviors and conditions. Third, to evaluate the practical feasibility and utility of the HOC methodology for occupational safety monitoring in small-scale maritime operations, including identifying implementation challenges and lessons learned. The findings provide valuable insights for maritime companies, safety managers, and occupational health professionals considering HOC implementation, offering practical guidance that complements larger epidemiological studies while contributing to the regional occupational health knowledge base relevant to Southeast Asian maritime operations.

Although previous studies have examined maritime safety behavior and occupational hazards, few have specifically investigated the practical implementation of Hazard Observation Cards (HOCs) in small-crew maritime operations in Southeast Asian contexts. Most prior studies focused on large-scale industrial environments or theoretical safety frameworks rather than real-time participatory hazard observation aboard operational vessels. Furthermore, previous research rarely combines quantitative hazard trend analysis with qualitative exploration of crew perceptions and implementation barriers.

The novelty of this study lies in its integration of participatory hazard observation, temporal trend analysis, and practical implementation evaluation within an Indonesian maritime operational setting. This study specifically applies Hazard Observation Card indicators, including people's reactions, compliance with personal protective equipment, hazard positioning, housekeeping conditions, equipment functionality, environmental hazards, and procedural compliance. By combining quantitative hazard distribution analysis with qualitative operational insights, this research provides practical evidence regarding the feasibility of HOC implementation in resource-limited maritime operations.

Materials and Methods

Study Design and Setting

This study employed a mixed-methods descriptive case study design to examine the implementation of Hazard Observation Cards (HOC) aboard a commercial vessel operating in Indonesian waters from March to May 2024. The quantitative component focused on documenting the frequency, categories, and temporal trends of unsafe actions and unsafe conditions identified through HOC submissions. The qualitative component explored crew perceptions, safety awareness, implementation barriers, and responses toward the HOC program through semi-structured interviews and field observations. The study was conducted aboard a commercial vessel operated by PT—Oceanindo during routine maritime operations in Indonesian territorial waters. The vessel operated primarily on domestic shipping routes, including cargo handling, navigation, engine operations, and onboard maintenance. The study population comprised all 15 active crew members aboard the vessel during the observation period, including officers, engineers, and deck crew. Because the crew size was relatively small, total population sampling was applied, meaning all crew members participated in the study. This approach enabled comprehensive observation of safety practices in the vessel's operational environment.

HOC Design and Implementation

The Hazard Observation Card was adapted from established Safety Training Observation Program designs with modifications for maritime contexts (Tao et al., 2024). Cards documented unsafe actions (personal protective equipment usage, reactions and positions, tools and equipment use, housekeeping) and unsafe conditions (workplace environment, equipment functionality, facility conditions, organizational issues) (Kristić et al., 2025). The Hazard Observation Card instrument comprised several key indicators tailored to maritime operational conditions. Unsafe action indicators included people's reactions, compliance with personal protective equipment, body positioning, procedural adherence, equipment-handling behavior, and situational awareness. Unsafe condition indicators included housekeeping conditions, equipment functionality, environmental hazards, workspace organization, lighting conditions, and simultaneous hazardous activities within operational areas. These indicators were selected to reflect common occupational hazards encountered during vessel operations.

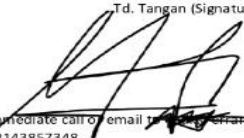
	OPS-MSF-MSE-4113 Date 17 Feb/20
OSCard Oceanindo Safety Card	
Diisi oleh pelapor (Filled by reporter)	
Uraian (Details) : I see the trash where the bridge has been full 	
Lokasi (Site)	Kegiatan (Activity) : Cargo operation
Tanggal (Date) : 10 July 2022	Jam (Time) : 19:00
Tindakan berlangsung yang dilakukan (Immediate action taken) I told the crew to clean it 	
STOP Card Issued? (✓) Ya/Yes () Tidak/No Akibat Langsung (Immediate consequences) Cars make the environment dirty 	
Saran pencegahan&perbaikan (Suggestion for prevention&improvement) Inform to all crew must pay attention with the environment 	
Lampirkan Bukti Pendukung (Bila ada) / Attach Supporting Evidence (if any)	
Informant (Pelapor) : Andi Pelsandra Vessel/ Dept. : OPS AQRA Sign : Memerlukan feedback / Do you require feedback?	Tanggal (Date) : 10 July 2022 Jabatan / Rank : 2nd Officer Location : L58 () Ya/Yes () Tidak/No
Atasan Pelapor (Line Supervisor/MSTRUCE) : Nama / Name : Abdul Malik Marhaban Td. Tangan (Signature) 	
Noted: Please submit to CP-DK Dept. upon immediate call or email to ops@oceanindo.com no telp. +622143857348 Save It. Stop It. Solve It. Corresponds Weekly Card setelah menandatangani keaslian	

Figure 1. *The Hazard Observation Card*

Cards required approximately three to five minutes to complete. All 15 crew members participated in a 2-hour training session that explained the HOC's purpose, completion procedures, and examples relevant to maritime operations (Erstad et al., 2023). Training emphasized systemic improvement rather than individual blame. Blank cards were placed throughout the vessel for easy access. Completed cards were collected daily by safety representatives and delivered to the ship's safety officer for review and corrective action. Weekly summaries of submissions and corrective actions were posted to maintain crew engagement (Wahid et al., 2023).

Data Collection & Data Analysis

The mixed-methods approach was implemented sequentially throughout the study period. Quantitative data were collected continuously through Hazard Observation Card submissions documenting frequencies and categories of unsafe actions and unsafe conditions. Qualitative observations and semi-structured interviews complemented these quantitative findings to explore

the underlying causes of unsafe behaviors, crew perceptions of safety culture, and responses to management interventions.

Quantitative analysis focused on identifying hazard distributions, monthly trends, and dominant unsafe categories using descriptive statistics and Cochran-Armitage trend tests. Qualitative thematic analysis was subsequently conducted to interpret operational experiences and contextual factors influencing safety behavior. Quantitative and qualitative findings were integrated during interpretation to strengthen data triangulation and improve the contextual understanding of HOC implementation effectiveness.

Ethical Considerations

This research received ethical approval from the Research Ethics Committee at Politeknik Pelayaran Surabaya. Written informed consent was obtained from all participants before data collection.

Study Limitations

The single-vessel, single-company focus limits generalizability. The small sample of 15 crew members precludes robust statistical analysis. The three-month duration provides only a snapshot and cannot assess long-term sustainability. Observer effects, in which crew behavior changes due to research participation, cannot be fully controlled. The lack of control vessel prevents causal conclusions about HOC effectiveness.

Results and Discussion

Participant Characteristics

The study included all 15 crew members aboard the vessel during the three-month observation period. The crew was male-only, typical for commercial maritime vessels in Indonesian waters. Ages ranged from 24 to 56 years (mean 37.4, SD 9.2). Maritime experience ranged from 2 to 28 years (mean 11.6, SD 7.8). The crew included three officers, four engineers, and eight deck crew. All had received the required basic safety training in accordance with international maritime regulations.

Table 1
Details of Participant

Characteristic	Details
Total Participants	15 crew members
Gender	Male
Rank Distribution	Officers (n=3); Engineers (n=4); Deck crew (n=8)
Type of Work	Navigation, Engineering, Deck operations, Housekeeping, Equipment handling
Data Sources	Interviews, Observations, HOC forms

Overview of Hazard Observations

Over the three months, 158 unsafe actions and conditions were documented through 87 completed HOC cards (Chang et al., 2021). The observations comprised 68 unsafe actions (43.0%) and 90 unsafe conditions (57.0%), indicating that environmental and organizational factors were slightly more prevalent than behavioral factors. Observations varied across months, showing a declining trend: March recorded 113 total violations (37 unsafe actions, 76 unsafe conditions); April recorded 96 violations (32 unsafe actions, 64 unsafe conditions); and May recorded 82 violations (25 unsafe actions, 57 unsafe conditions). This temporal pattern suggests that HOC implementation combined with management interventions may have contributed to improved safety conditions and

behaviors. However, alternative explanations, including observer effects or operational variations, cannot be ruled out (Chang et al., 2021). The monthly reduction in violations demonstrated progressive improvement during the implementation period. Total recorded hazards decreased by 27.4% between March and May. Unsafe actions declined from 37 in March to 25 in May, a 32.4% reduction. Unsafe conditions decreased from 76 to 57 observations, indicating a 25.0% reduction during the same period.

Temporal Trends

Statistical analysis using the Cochran-Armitage test indicated a significant decreasing trend in total violations over three months ($Z = -2.84$, $p = 0.004$). When analyzed separately, unsafe actions showed a declining trend ($Z = -2.12$, $p = 0.034$), as did unsafe conditions ($Z = -2.67$, $p = 0.008$).

Table 2
Details of Temporal Trends

Month	Unsafe Actions (%)	Unsafe Conditions (%)
March	23.32%	48.68%
April	20.33%	40.67%
May	15.29%	36.71%

Types of Unsafe Actions

Non-use of personal protective equipment represented the most common unsafe action at 42.6% ($n=29$), including failures to wear hard hats, safety harnesses, gloves, and safety shoes. Failure to follow established procedures accounted for 23.5% ($n=16$), including shortcuts that bypassed safety steps and unauthorized task performance. Lack of awareness or care accounted for 17.6% ($n=12$), manifesting as inattention and complacency. Time pressure contributed to 10.3% ($n=7$), with crew rushing tasks and skipping safety checks. Psychological factors, including fatigue and stress, accounted for 6.0% ($n=4$). Interviews revealed that PPE discomfort during prolonged work, time pressures during port operations, and complacency for familiar tasks contributed to unsafe actions (Fan & Yang, 2024).

Table 3
Details of Unsafe Actions

Type of Unsafe Action	Frequency (n)	Description
Not wearing PPE	68	Crew not using helmets, gloves, or safety shoes
Reaction & position hazards	18	Unsafe proximity, improper body positioning
Failure to follow procedures*	— (qualitative)	Reported in interviews, inconsistent SOP compliance
Lack of awareness/care*	— (qualitative)	Inattention, complacency in routine tasks
Time pressure & psychological factors*	— (qualitative)	Rushing, fatigue, stress

Types of Unsafe Conditions

Housekeeping deficiencies represented the largest category at 53.3% ($n=48$), including materials in walkways, improper tool storage, inadequate waste disposal, and spilled liquids creating slip hazards. Tools and equipment problems constituted 26.7% ($n=24$), including damaged equipment, missing safety guards, and inadequate maintenance. Multiple hazardous tasks occurring

simultaneously accounted for 12.2% (n=11). Poor environmental conditions contributed 7.8% (n=7), including inadequate lighting and ventilation (Kasyk et al., 2023). Interviews indicated that competing demands during busy periods led to deferred cleanup tasks and unclear assignments of housekeeping responsibilities.

Table 4
Details of Unsafe Conditions

Type of Unsafe Condition	Frequency (n)	Description
Housekeeping deficiencies	48	Waste, clutter, slippery floors, disorganized spaces
Tools & equipment problems	24	Damaged, poorly maintained, or misused equipment
Multiple tasks in one area	11	Overlapping high-risk tasks in the same workspace
Poor environmental conditions*	— (qualitative)	Weather, unstable sea motion, poor visibility

Location Distribution. Deck work areas accounted for 41.8% of observations, engine room 29.1%, accommodation and galley 15.8%, bridge 8.9%, and other spaces 4.4%.

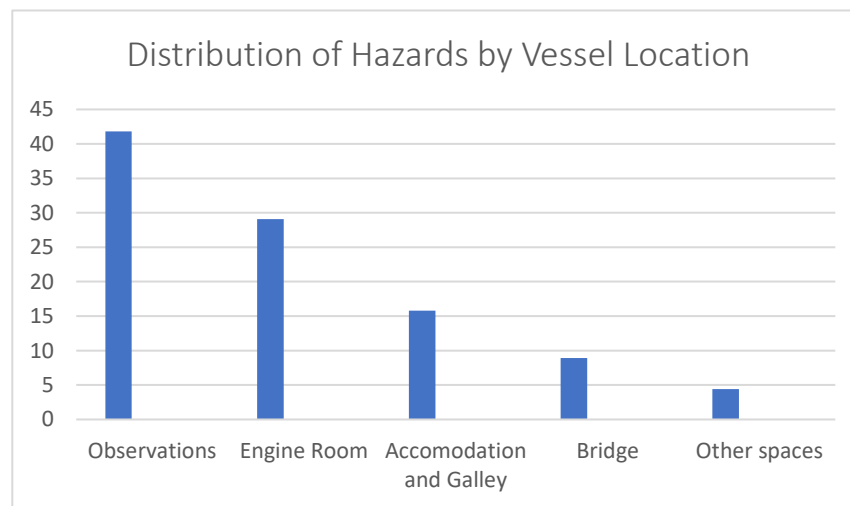


Figure 2. *The Distribution of Hazards by Locations on the Deck*

The distribution of hazard observations across vessel locations reflects the operational realities and risk-exposure patterns in maritime work environments (Chaal et al., 2023). Deck areas, which recorded the highest proportion of hazards, are typically the most dynamic spaces where loading, mooring, cargo handling, and routine deck maintenance occur, activities that inherently carry elevated risk due to variable sea conditions, heavy equipment use, and frequent crew movement (Aydin et al., 2024). The engine room's substantial proportion of hazards underscores the technical complexity of machinery spaces, where noise, heat, confined spaces, and mechanical energy sources increase the likelihood of unsafe conditions if maintenance or supervision lapses (Xie et al., 2023). Meanwhile, hazards identified in accommodation, galley, and bridge areas demonstrate that risks are not confined to high-intensity work zones; everyday activities such as cooking, housekeeping, and navigation can also pose preventable risks when cleanliness, equipment organization, or procedural

compliance are not maintained (Jang et al., 2023). This spatial distribution highlights the need for tailored safety strategies that reflect the unique operational demands and risk profiles of each work area rather than adopting a uniform approach across the vessel (Tao et al., 2024).

Management Interventions and Challenges

Following identification of recurring violations, management implemented targeted interventions including safety briefings, written warnings, posted reminders, and increased supervision. PPE violations decreased by 38% from March to May, housekeeping violations decreased by 33%, and procedural violations decreased by 29%. Interviews indicated increased crew safety awareness and motivation when observations resulted in visible corrective actions. Implementation challenges included variable participation rates, hierarchical reporting barriers, time constraints, and administrative burden for safety officers managing submissions and responses.

This case study assessed the implementation of a Hazard Observation Card (HOC) program aboard a commercial vessel in Indonesian waters over 3 months. Three main findings emerged: (1) unsafe conditions were slightly more prevalent than unsafe actions; (2) both categories showed statistically significant monthly declines; and (3) PPE non-use and housekeeping deficiencies were the most frequent violations. Together, these findings indicate that HOC can function as a practical participatory safety tool even in small-crew maritime operations.

Relationship to Existing Literature

The nearly balanced distribution between unsafe actions (43%) and unsafe conditions (57%) offers nuance to the often-cited claim that human error accounts for the majority of maritime accidents (Maternová et al., 2023). While unsafe actions directly contribute to incidents, unsafe conditions often arise from systemic or organizational shortcomings. Similar to earlier studies, PPE non-use remained the most common unsafe action (Lan et al., 2024). Interviews showing discomfort, time pressure, and risk normalization as key barriers are also consistent with research from land-based industries, suggesting that solutions such as comfort-oriented PPE procurement, reinforcement during routine tasks, and workload adjustments may be transferable to maritime settings (Atasoy et al., 2024). Housekeeping deficiencies were the leading unsafe condition. Given the confined structure of vessels, poor housekeeping can quickly affect operational safety, emergency access, and crew mobility (Zu et al., 2024). This aligns with previous findings that housekeeping quality frequently reflects a broader organizational safety culture. Strengthening responsibility assignments, storage systems, and supervisory checks may therefore yield disproportionate safety benefits.

Interpretation of Temporal Trends

The observed decline in hazards across three months suggests a potential positive impact from the HOC program and subsequent management actions. Increased hazard awareness, visible corrective measures, and heightened safety communication were likely contributors. However, improvements may also reflect short-term observer effects, seasonal operational variability, or reduced reporting as the program became routine. Without a comparison vessel or a longer observation period, the durability of improvements cannot be established. Despite these limitations, qualitative reports from crew members indicate meaningful changes in safety attitudes, suggesting that some improvements extended beyond superficial compliance. Still, sustained monitoring is needed to confirm whether reductions persist once research-related attention decreases.

Practical Implications for Maritime Operations

The findings demonstrate that HOC programs are feasible for vessels with small crews and limited resources (Mullins-Jaime & Smith, 2023). Even with 15 participants, the program generated

substantial safety data and supported targeted interventions. This suggests that smaller companies, often lacking full-time safety teams, can still benefit from structured participatory observation systems. The concentration of hazards in specific categories and locations provides a basis for focused interventions (Mullins-Jaime & Smith, 2023). Prioritizing PPE compliance and housekeeping standards may produce the greatest immediate impact. Importantly, the study highlights that HOC effectiveness depends heavily on management responsiveness. When corrective actions were visible and timely, crew engagement increased; conversely, a lack of feedback risks diminishing participation. Clear procedures for card review, follow-up, and communication should therefore be established as part of implementation (Mullins-Jaime & Smith, 2023; Xi et al., 2025). Hierarchical dynamics also represent a challenge. Some crew members expressed hesitation in reporting issues involving senior officers. For HOC to function as intended, companies must cultivate a non-punitive reporting culture and clearly emphasize that observations are intended to improve the system, not to assign individual blame.

From a broader occupational safety perspective, the findings indicate that participatory safety monitoring systems may be particularly valuable in operational environments characterized by limited personnel, dynamic risk exposure, and constrained supervisory capacity. In maritime settings, where formal inspections cannot continuously capture evolving hazards, crew-based observation mechanisms provide an adaptive layer of real-time safety surveillance. This suggests that HOC implementation should not merely be viewed as a reporting tool, but as part of a broader organizational safety culture strategy emphasizing shared responsibility, communication, and proactive hazard prevention.

Conclusion

This case study demonstrates that the Hazard Observation Card (HOC) program can be effectively implemented aboard a small-crew commercial vessel and can meaningfully support the identification of unsafe actions and unsafe conditions in daily maritime operations. Across three months, the crew documented 158 hazards, with statistically significant declines in both unsafe behaviors and unsafe conditions. The most frequent issues, PPE non-use and housekeeping deficiencies, highlight practical target areas for safety improvement and indicate that even in resource-limited maritime settings, systematic observation can reveal clear patterns of preventable risk. The combination of active crew participation, visible management follow-up, and structured feedback loops appeared to contribute to increased safety awareness and improved compliance. Although observer effects and operational variations may have influenced short-term improvements, qualitative feedback suggests emerging positive shifts in safety attitudes. These findings underscore that HOC programs function best when integrated into broader safety management systems with leadership support, non-punitive reporting cultures, and consistent corrective action.

Given the single-vessel design, small sample size, and limited observation period, the results should be interpreted as contextual and exploratory rather than generalizable. Nonetheless, the study provides actionable insights for maritime companies seeking low-cost strategies to strengthen safety engagement. Prioritizing housekeeping protocols, PPE compliance, and hazard feedback mechanisms may yield immediate benefits, while long-term adoption of HOC programs warrants continued monitoring. Future research should examine longer implementation periods, multiple vessels, and links between HOC data and actual incident outcomes. Even so, this study offers practical evidence that participatory hazard observation can enhance situational awareness, strengthen communication between crew and management, and contribute to safer maritime operations in Indonesian waters.

From a theoretical perspective, this study supports behavior-based safety theory by demonstrating that continuous participatory observation and feedback mechanisms can enhance safety awareness and reduce unsafe practices in maritime operations. The findings also reinforce

occupational safety perspectives, emphasizing the interaction between unsafe human behavior and organizational safety conditions in accident prevention. In practice, the study provides evidence that low-cost participatory hazard observation systems can strengthen safety monitoring in small-scale maritime environments. Future studies should examine multi-vessel implementation, longer observation periods, and the relationships between HOC implementation and actual accident-reduction outcomes. The study contributes to maritime occupational safety research by providing empirical evidence regarding the practical application of participatory hazard observation systems in small-scale vessel operations within Southeast Asia. The findings demonstrate that Hazard Observation Cards can support early hazard identification, strengthen communication between crew and management, and improve safety awareness even in resource-constrained operational environments.

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