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Causal Drivers of Sinking and Capsizing Accidents Involving Passenger Ships and Roll-on/Roll-off Ferries in Indonesia

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ABSTRACT

This study examined the causal pathways underlying passenger-ship sinking and capsizing/listing accidents in Indonesia during 2018–2021 using the official National Transportation Safety Committee (NTSC) maritime accident database. Of 1,635 recorded incidents across all vessel categories, 586 involved passenger ships, including Roll-on/Roll-off (Ro-Ro) ferries; among these, 265 cases (45%) ended in sinking/capsizing and constituted the analytic dataset. A mixed-method content-analysis design was employed by integrating the Human Factors Analysis and Classification System for Maritime Accidents (HFACS-MA), the Casualty Analysis Support Method for Effective Training (CASMET), and the Systems-Theoretic Accident Model and Processes (STAMP) into a three-domain codebook covering technical/equipment, human/operational, and environmental factors. Cross-case coding of the full passenger-ship sinking/capsizing subset (n = 265) showed that a large share of records contained insufficient narrative detail to assign a specific initiating trigger (T0; n = 127, 47.9%). Among cases with an identifiable trigger, adverse weather/wave/current trigger was the most frequent category (T6; n = 45, 17.0%), followed by hull breach/water ingress/structural failure (T3; n = 32, 12.1%) and instability/cargo shift/capsize without prior mechanical trigger (T7; n = 28, 10.6%). Power-related failures, including blackout/power loss (T1; n = 8, 3.0%) and propulsion/engine/steering failure (T2; n = 3, 1.1%), were less frequent but remained operationally significant as potential initiating triggers in high-consequence accident sequences. However, the KMP *Yunicee* reconstruction showed that such failures can become highly consequential in high-current corridors by eliminating maneuvering control and narrowing the response window. The dominant pattern was a cascading pathway from an initiating technical trigger to maneuvering-control loss, environmental loading amplification, stability loss, and ultimately sinking/capsizing. These findings indicate that maritime safety interventions should prioritize technical resilience, enforced maintenance and redundancy standards, and condition-based operational limits rather than geographically localized responses alone.

1. INTRODUCTION

Maritime transportation forms the backbone of archipelagic nations, where the sea functions as a primary corridor for economic activity and social connectivity. In Indonesia, passenger-ship services—including Roll-on/Roll-off (Ro-Ro) ferries are indispensable for inter-island mobility of people and goods and for sustaining regional economies [1, 2]. This connectivity enables access to essential services and markets and supports livelihoods linked to passenger transport and associated sectors. However, high dependence on passenger shipping also creates vulnerability: disruptions caused by technical unreliability or adverse sea conditions can isolate communities and generate cascading socio-economic impacts [3].

The sustainability and safety of these operations are therefore paramount. As climatic variability and operational demand intensify, passenger-shipping systems face increased exposure to environmental risk while maintaining service expectations [1, 3]. Despite their strategic role, the maritime sector—particularly in developing contexts—continues to experience a high accident burden, with passenger ships (including Ro-Ro ferries) recurrently involved in catastrophic outcomes. The persistence of sinking and capsizing/listing events highlights a critical safety deficit requiring investigation grounded in incident evidence and causal-chain logic, rather than generic attributions, to reduce loss of life and disruption.

The central problem addressed here is the continued occurrence of passenger-ship sinking and capsizing/listing in Indonesian waters—events that represent the most severe failure mode in terms of human consequences. The core challenge is to move beyond broad explanations (e.g., "poor standards") and to identify dominant causal factors and their interactions as reproducible pathways. While international conventions define baseline requirements, Indonesia's operational context—characterized by varied vessel conditions, high route dependence, and challenging hydro-oceanographic exposure—requires context-specific evidence to prioritize effective interventions. Accordingly, this study focuses on reconstructing how technical triggers, operational conditions, and environmental stressors combine to produce catastrophic outcomes.

Prior research provides important insights into contributing mechanisms. Studies on Ro-Ro and passenger ships have highlighted stability-relevant design features, including vulnerabilities associated with large open vehicle decks and the potential for cargo/vehicle movement under rough conditions [4, 5]. Other work emphasizes how ballast arrangements, appendages, and loading conditions can influence stability margins under rolling or asymmetric loading [6, 7]. Beyond vessel design, operational factors play a crucial role. The effectiveness of emergency evacuation procedures, for instance, is heavily dependent on crew training and passenger awareness, with design shortcomings often hindering a swift response [8]. However, these factors are often discussed in isolation, leaving uncertainty about how they combine as sequences that produce sinking/capsizing in Indonesia.

A review of closely related literature indicates that while individual risk factors—technical shortcomings, human/organizational issues, regulatory limitations, and adverse weather—are well documented, their interaction as causal chains is less consistently analyzed. Existing studies discuss monsoonal influences on transport accidents [9, 10], competency and stability considerations in Ro-Ro operations [11], and broader human-factor and work-organization risks in shipping. However, Indonesia-focused studies rarely provide a coded, cross-case typology of sinking/capsizing pathways for passenger ships (including Ro-Ro ferries) that links initiating technical triggers to environmental escalation and operational context. This is the key research gap addressed by the present study: An integrated, dataset-grounded analysis that identifies dominant causal pathways (typologies) underlying catastrophic passenger-ship losses in Indonesia.

Therefore, the objective of this study is to identify the dominant causal pathways underlying passenger-ship sinking/capsizing accidents in Indonesia, treating Ro-Ro ferries as a passenger-ship sub-category. The study tests the hypothesis that catastrophic outcomes typically reflect a cascading sequence in which an initiating technical malfunction—such as propulsion failure or blackout/power loss—reduces maneuvering control and is subsequently amplified by environmental exposure (e.g., strong currents and/or high waves), resulting in stability loss. Using National Transportation Safety Committee (NTSC) accident records from 2018–2021, the analysis produces (i) quantitative anchors (counts/proportions of coded triggers and co-factors) and (ii) a coded pathway typology supported by worked case reconstruction. The intended contribution is actionable evidence to strengthen maintenance/inspection priorities, condition-based operational limits, and crew preparedness for passenger-ship safety in Indonesia and comparable archipelagic settings.

2. METHOD

This study employed a mixed-method content-analysis design with qualitative case reconstruction, rather than a purely qualitative approach. The design combined (i) quantitative descriptive summaries (counts and proportions of coded causal factors and outcomes) with (ii) qualitative reconstruction of representative sinking/capsizing narratives to explain how interacting factors form recurrent causal chains. This approach is appropriate because maritime accidents arise from coupled technical, human/operational, organizational, and environmental conditions; relying on a single mode risk either loses contextual depth (purely quantitative) or loses cross-case comparability (purely qualitative). Consistent with prior methodological guidance, the study used detailed incident narratives to retain context while applying a standardized coding scheme that supported reproducible cross-case synthesis and identification of system-level vulnerabilities [12, 13]. Throughout this paper, the term "passenger ships" includes Ro-Ro ferries as a passenger-ship sub-category.

Table 1. Summary of the maritime accident dataset (2018–2021)

Data Characteristic	Description
Data source	Official and public maritime accident reports (National Transportation Safety Committee (NTSC) database)
Geographic scope	Indonesian archipelagic waters
Time period	January 2018 – December 2021
Total incidents (all vessel types; all accident types)	1,635
Passenger-ship incidents (all accident types; incl. Roll-on/Roll-off (Ro-Ro) ferries)	586
Sinking/capsizing incidents (all vessel types)	779
Passenger-ship sinking/capsizing incidents (analytic subset; including Ro-Ro ferries)	265
Vessel category analyzed in this study	Passenger ships (including Ro-Ro ferries as a sub-category)
Outcome types analyzed in this study	Sinking and capsizing/listing

The primary data source was an official maritime accident database covering incidents in Indonesian waters from January 2018 to December 2021, compiled from investigation reports and public records. Each record provided, at a minimum, vessel type, vessel name, incident date, location, and an incident description. A two-stage screening process was applied to construct the analytic dataset. Stage 0 (population): The database contained 1,635 maritime accident records across all vessel categories and accident types during 2018–2021. Stage 1 (passenger-ship screening): All records were screened to identify incidents involving passenger ships (including Ro-Ro ferries), yielding 586 incidents across accident types. Stage 2 (catastrophic outcome inclusion): The passenger-ship set was then filtered to retain only cases with outcomes explicitly classified as sinking, resulting in 265 incidents. This purposive, outcome-based inclusion kept the analysis focused on catastrophic failure mechanisms while preserving traceability from the full population to the analytic subset. Dataset characteristics are summarized in Table 1.

To support a granular analysis while maintaining reproducibility, the study employed (a) incident-level coding applied to all passenger-ship sinking/capsizing cases (n = 265) and (b) an illustrative case subset selected to demonstrate how dominant causal chains unfold in practice. The analytical framework integrated established maritime accident models operationalized through explicit outputs. The Human Factors Analysis and Classification System for Maritime Accidents (HFACS-MA) was used to structure human/operational and organizational contributors across levels—including unsafe acts, preconditions, and supervisory/organizational influences [14]; while the Casualty Analysis Support Method for Effective Training (CASMET) supported consistent identification of accident type, initiating event, and outcome descriptors for cross-case comparison [15]. These frameworks were translated into a three-domain codebook covering technical/equipment, human/operational (including organizational), and environmental factors, each with defined subcodes and evidence cues. The codebook is reported as a summary table in this study, listing the code, definition, and example report phrases to enable consistent coding across cases.

A systems perspective informed by the Systems-Theoretic Accident Model and Processes (STAMP) was applied to interpret how coded factors combine into control, enforcement, and organizational failures across the wider safety system. STAMP was operationalized as a compact mapping output classifying each case's coded factors into (i) initiating control losses (e.g., loss of propulsion or steering), (ii) inadequate safety constraints (e.g., insufficient operational limits under adverse sea-state or current conditions), and (iii) latent systemic conditions (e.g., maintenance gaps, inspection/enforcement deficiencies, and organizational pressures). This approach supports analysis beyond proximate events by tracing how latent conditions shape both accident initiation and escalation [16, 17]. Using this multi-layered lens, the study reconstructed accident sequences and identified critical intersection points at which technical triggers and environmental exposure jointly escalated consequences.

Finally, the coded results were synthesized to identify recurring causal-pathway typologies (dominant chains) and to quantify the frequency of key triggers and co-factors. The synthesis reported counts and proportions of initiating technical triggers (e.g., blackout/propulsion loss), environmental stressors (e.g., high waves/strong currents), and human/organizational contributors, and summarized typical sequence structures (e.g., technical trigger → loss of control → environmental loading → stability loss → sinking/capsizing). Conclusions are framed as analytic (theoretical) generalizations rather than statistical generalizations: findings are interpreted as context-sensitive to passenger-ship operations (including Ro-Ro ferries) in Indonesia during 2018–2021, while offering transferable insights to comparable archipelagic settings. This study acknowledges its principal limitation: reliance on the accuracy and completeness of official accident reports, which may be subject to reporting biases [13]. To mitigate this, the study documents all inclusion/exclusion rules, reports the full codebook, and provides worked examples mapping incident narratives to coded factors and derived causal pathways.

3. RESULTS AND DISCUSSIONS

3.1 Distribution and spatial pattern of passenger-ship accidents

The analysis of all recorded maritime incidents during 2018–2021 (n = 1,635) reveals a clear severity pattern. As shown in Figure 1, although sinking and capsizing/listing are not the most frequent outcomes, they are associated with a disproportionately high number of fatalities and persons reported missing at sea. This establishes sinking/capsizing as the most severe accident outcomes in terms of human cost and motivates a focused investigation of the dominant causal pathways that lead to these catastrophic failures.

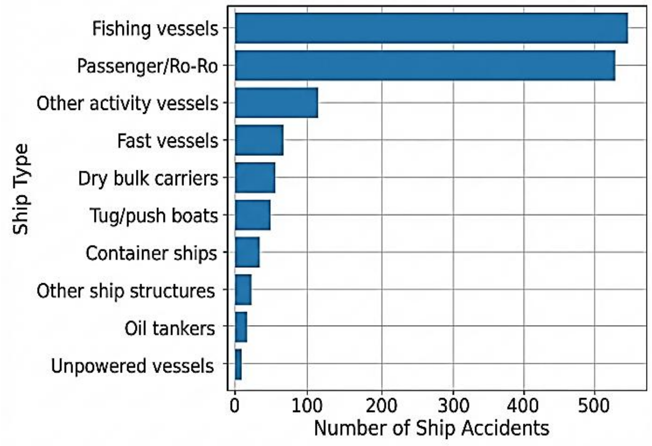

Figure 1. Maritime accident outcomes (2018–2021): Accident counts and associated fatalities/missing persons, by ship category [5]

Table 2. Distribution of recorded accident types for passenger ships (including Roll-on/Roll-off (Ro-Ro) ferries), 2018–2021 (n = 586)

Accident Type	Frequency	Percentage of Total
Burned/exploded	81	13.8%
Sinking/capsizing	265	45.2%
Collisions	54	9.2%
Death/injury/missing at sea	54	9.2%
Grounding	74	12.6%
Machinery/equipment /structural damage	58	9.9%
Total	586	100%

When isolating incidents involving passenger ships (including Ro-Ro ferries as a passenger-ship sub-category), a clear vulnerability to catastrophic outcomes emerged. Of 586 recorded passenger-ship incidents (all accident types), 265 resulted in sinking/capsizing, equivalent to 45% of passenger-ship incidents in the period (Table 2). Within all sinking/capsizing accidents across vessel categories (n =

779), passenger ships accounted for 265 cases and represented the second-largest contributor after fishing vessels (331 cases) [18]. These results indicate that catastrophic stability-related outcomes form a substantial component of passenger-ship accident records and are consistent with maritime safety literature on Ro-Ro/passenger-ship vulnerability under adverse conditions [19].

The geographic distribution of passenger-ship sinking/capsizing incidents was widely dispersed across the Indonesian archipelago, rather than concentrated in a few fixed locations. As shown in Figure 2, cases were recorded across the nation's primary sea lanes. While major events occurred in chokepoints such as the Bali Strait and Sunda Strait, the mapped cases also appeared in other operational areas, including the Java Sea, the Makassar Strait, and Eastern Indonesian waters (e.g., around the Maluku Islands) (Table 3). This dispersion supports a condition-based interpretation of risk: catastrophic outcomes can arise wherever high traffic exposure intersects with challenging hydro-oceanographic conditions, rather than being confined to one or two straits.

This spatial pattern indicates that catastrophic failure risk for passenger ships (including Ro-Ro ferries) should be treated as a system-wide safety management issue, not a problem confined to one or two straits. Operational risk is interpreted using two exposure dimensions—environmental severity and traffic density—summarized in Table 4. While the Bali and Sunda Straits remain critical due to intense hydro-oceanographic conditions, other regions (e.g., the Java Sea and Makassar Strait) can also present elevated overall risk when traffic intensity and recurring adverse conditions co-occur. Accordingly, "hotspots" are defined as high-risk conditions (traffic × environment) rather than fixed geographic labels.

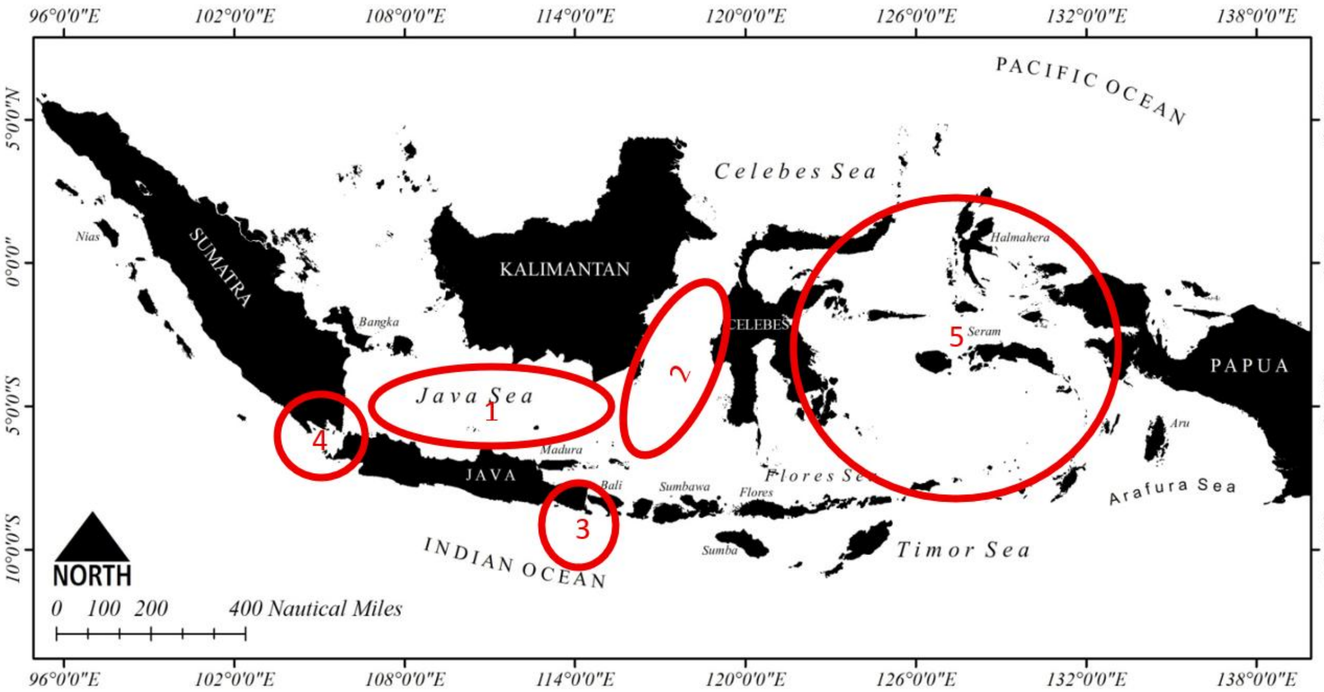

Figure 2. Geographic distribution of passenger-ship sinking/capsizing incidents (including Roll-on/Roll-off (Ro-Ro) ferries), 2018–2021

Table 3. Proportion of sinking/capsizing incidents among passenger-ship accidents in selected operational areas (2018–2021)

Operational Area	Sinking/Capsizing Incidents	Other Accident Types	Total Passenger-Ship Incidents	Proportion of Sinking/Capsizing
Java Sea	8	15	23	34.80%
Makassar Strait	5	9	14	35.70%
Bali Strait	3	4	7	42.90%
Sunda Strait	4	6	10	40.00%
Eastern Indonesia	6	11	17	35.30%
All Passenger Ships (2018–2021)	265	321	586	45.20%

Table 4. Qualitative risk matrix for key passenger-ship operational areas (2018–2021)

Operational Area	Environmental Severity	Traffic Density	Overall Risk Level
Java Sea	Medium	High	High
Makassar Strait	High	Medium	High
Bali Strait	Very High	Medium	High
Sunda Strait	High	High	High
Eastern Indonesian	High	Low	Medium-High

3.2 Dominant causal factors in sinking and capsizing incidents

Cross-case review of passenger-ship sinking/capsizing incidents (including Ro-Ro ferries as a passenger-ship sub-category) identified a recurring pathway structure: (1) an initiating technical trigger (e.g., blackout/power loss, propulsion failure, or steering loss), followed by (2) loss of maneuvering control, which then interacted with (3) environmental loading (e.g., high waves and/or strong currents), culminating in (4) stability loss and sinking/capsizing [5]. To ensure consistent cross-case interpretation, causal factors were coded using the three-domain scheme (technical/equipment; human/operational; environmental/external), summarized in Table 5.

Table 5. Simplified coding scheme for passenger-ship sinking/capsizing cases (including Roll-on/Roll-off (Ro-Ro) ferries)

Domain	Subcodes (Simplified)	What it Captures (1 line)
Technical/Trigger Coding	T0 unspecified/insufficient information; T1 blackout/power loss; T2 propulsion/engine/steering failure; T3 hull breach/water ingress/structural failure; T4 overloading/excess passengers or cargo; T5 collision/grounding/struck object; T6 adverse weather/wave/current trigger; T7 instability/cargo shift/capsize without prior mechanical trigger	Records the initiating trigger category used for cross-case coding of passenger-ship sinking/capsizing incidents.
Human/Operational	H1 go–no-go decision; H2 watchkeeping/situational awareness; H3 maintenance readiness; H4 emergency response/evacuation; H5 training/competence; H6 loading/securing practice	Actions or decisions that contribute to accident initiation or intensify/mitigate escalation.
Environmental/External	E1 high waves; E2 strong currents; E3 strong wind; E4 reduced visibility; E5 traffic density; E6 route constraints (straits/chokepoints)	External conditions that increase hazard exposure and amplify accident escalation.

Table 6. Worked example: Coding and causal chain reconstruction for KMP *Yunicee* (Bali Strait)

Case	Initiating Technical Trigger	Environmental Amplifier	Resulting Mechanism	Outcome
KMP *Yunicee*	T1 blackout/power loss → T2 loss of propulsion/control	E2 strong currents (Bali Strait) (+ E6 route constraint if stated)	Loss of maneuverability → stability loss under environmental loading	Sinking

Table 7. Frequency of initiating technical triggers across passenger-ship sinking/capsizing cases

Code	Initiating Trigger Category	n	%	Remarks
T0	Unspecified/insufficient narrative detail	127	47.9	Narrative is too limited to assign a specific initiating trigger reliably
T1	Blackout/power loss	8	3	Includes cases of total power/engine blackout. Low absolute frequency but associated with high-severity cascading sequences (see KMP *Yunicee*)
T2	Propulsion/engine failure	3	1.1	Includes documented engine failure or loss of propulsion
T3	Hull breach/internal flooding	32	12.1	Includes leakage, structural breach, or flooding, initiating loss of buoyancy
T4	Steering failure/loss of directional control	2	0.8	Includes rudder or steering-related control loss
T5	Safety system or pump failure	20	7.5	Includes bilge pump or related safety-system failure contributing to escalation
T6	Adverse weather/waves/currents	45	17	Environmental forcing is recorded as the initiating condition
T7	Instability/cargo shift/capsizing without prior mechanical trigger	28	10.6	Instability-driven loss of balance or capsize without a clearly documented antecedent mechanical failure
	Total	**265**	**100**	

Note: Table 7 is based on the full coded passenger-ship sinking/capsizing subset (n = 265). Frequencies are not restricted to a smaller sub-sample. T0 denotes cases in which the available accident narrative was too limited to assign a more specific initiating trigger category.

The sinking of the passenger ship (Ro-Ro ferry) KMP *Yunicee* in the Bali Strait illustrates the dominant causal pathway. The accident narrative indicates an initiating power blackout (T1) that produced loss of propulsion and maneuverability (T2) in a corridor characterized by strong currents (E2). As a result, the disabled vessel was exposed to environmental forces that amplified instability, culminating in sinking. Table 6 provides the compact case-to-code mapping and reconstructed causal chain for this incident.

Across the coded dataset (n = 265), the distribution of initiating trigger categories is presented in Table 7. The largest single category was T0 (not stated/insufficient information), accounting for 127 cases (47.9%), indicating an important reporting-completeness limitation in the source database. Among cases with an identifiable initiating trigger, the most frequent category was T6 (adverse weather/wave/current trigger) with 45 cases (17.0%), followed by T3 (hull breach/water ingress/structural failure) with 32 cases (12.1%), T7 (instability/cargo shift/capsize without a prior mechanical trigger) with 28 cases (10.6%), and T5 (collision/grounding/struck object) with 20 cases (7.5%). Less frequent categories included T1 (blackout/power loss) with 8 cases (3.0%), T2 (propulsion/engine/steering failure) with 3 cases (1.1%), and T4 (overloading/excess passengers or cargo) with 2 cases (0.8%). These results suggest that passenger-ship sinking and capsizing accidents in Indonesia are not driven by one overwhelmingly dominant technical trigger, but rather by a combination of environmental exposure, structural compromise, instability processes, collision-related events, and, in a smaller number of cases, loss of propulsion or maneuvering capability.

While Table 7 provides the distribution of coded trigger categories, frequency alone does not fully capture the severity or escalation potential of a given initiating condition. Some categories occur less often in the database yet remain operationally significant because they can sharply reduce response options once they occur. This is particularly important for blackout/power loss and propulsion/engine/steering failure, which together account for only 11 cases (4.2%), but may rapidly create a high-risk vessel state when they occur in narrow waterways, under strong current exposure, or during adverse sea conditions. Accordingly, the interpretation of sinking and capsizing accidents should not rely solely on how often a trigger appears, but also on how an initial disruption interacts with environmental loading and vessel condition to generate a cascading sequence toward loss of control, stability failure, and final casualty.

The KMP *Yunicee* case provides a clear example of this cascading mechanism. In this case, the accident sequence began with a reported blackout/power-loss condition, which immediately reduced the vessel's propulsion and maneuvering capability. In a high-current operational corridor such as the Bali Strait, this loss of control was critical because it left the vessel unable to maintain heading, counter drift, or respond effectively to external hydrodynamic forces. Once the vessel entered this compromised state, the surrounding environmental conditions acted not merely as background context but as active escalation factors that intensified the consequences of the initial technical disruption.

The analytical significance of the KMP *Yunicee* case lies in the way it illustrates the transition from an initiating trigger to a catastrophic outcome through a linked sequence of interacting conditions. The blackout itself did not automatically produce sinking; rather, it created a vulnerable vessel state. That state was then amplified by strong currents, limited maneuvering space, and reduced recovery capacity under environmental loading. In this sense, the accident can be interpreted as a cascading sequence consisting of: (1) blackout/power loss, (2) loss of propulsion and maneuverability, (3) intensified exposure to current and wave action, (4) progressive loss of stability, and (5) sinking. This reconstruction is analytically important because it demonstrates how even a relatively less frequent trigger category can produce a disproportionately severe outcome under certain operating conditions.

Taken together, the cross-case coding and the KMP *Yunicee* reconstruction indicate that the dominant safety problem is not simply the recurrence of one specific trigger, but the repeated emergence of vulnerable vessel states that can rapidly escalate under environmental loading. This interpretation is consistent with literature describing stability risks in passenger and Ro-Ro ships [19] and with studies showing that severe sea states are strongly associated with accident escalation [5, 20]. The critical risk mechanism is therefore the interaction between triggering conditions and concurrent environmental forcing. When a vessel experiences blackout, propulsion or steering failure, hull breach, instability, or severe weather exposure, it can transition rapidly from controllable navigation to an increasingly unstable or uncontrolled condition. This helps explain why sinking and capsizing events are disproportionately fatal, even when they are not the most frequent accident types overall.

Human and organizational factors remain important upstream contributors to these accident pathways. The coded trigger categories should not be interpreted as purely immediate technical events detached from the broader management context. Many initiating conditions are shaped by antecedent decisions related to maintenance regimes, inspection quality, loading control, route planning, and weather-based operational judgment. Decisions to sail under marginal sea-state conditions may similarly reflect commercial pressure, schedule constraints, and weaknesses in organizational safety culture [21]. Accordingly, strengthening competency-based training, Crew Resource Management (CRM), loading discipline, and safety leadership should be viewed as critical control layers that can reduce both initiation risk and escalation risk [18, 22].

Overall, the observed risk profile supports a shift from localized interventions to a systems-oriented national maritime safety strategy, given the socio-economic impacts of major passenger-ship disasters on coastal communities [23]. Two evidence-linked priorities follow directly from the coded pathway results. First, technical and structural resilience should be strengthened to reduce the occurrence and consequences of initiating triggers, including blackout/power loss, propulsion or steering failure, and hull breach/water ingress, through consistently enforced maintenance, inspection, watertight integrity, and redundancy standards for both primary and auxiliary systems [5]. Second, escalation control should be improved by implementing nationwide, condition-based operational limits (weather/sea-state/current thresholds) for passenger-ship routes, supported by real-time environmental information and clear go/no-go decision rules [24]. These recommendations remain context-sensitive to the present dataset, but they provide analytically grounded direction for improving passenger-ship safety in Indonesia.

4. CONCLUSIONS

This study demonstrated that the dominant pathway underlying sinking and capsizing accidents involving passenger and Ro-Ro ships in Indonesia is the cascading interaction between an initiating technical failure—such as a power blackout or engine failure—and adverse environmental conditions such as strong currents or high waves. The findings indicate that the associated risk is not a localized phenomenon confined to a few hotspots but rather a systemic vulnerability distributed across the entire archipelago. The key implication is that maritime safety strategies must shift from a focus on specific geographical locations to mitigating high-risk conditions wherever they may arise. This study contributes by identifying a specific, recurring causal chain as a primary target for intervention. Future research should quantitatively evaluate the effectiveness of vessel maintenance programs and structured crew training in interrupting this failure sequence.

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