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Beyond the Ship: A 4M Framework Analysis of Safety Risks and Tour Guide Preparedness in Shore Excursion

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Abstract

Safety incidents during shore excursions can disrupt cruise itineraries and threaten tourist well-being. This study examines incident-related factors and tour guide preparedness at Company A, a destination management company operating in Bali. A qualitative descriptive design combined content analysis of 45 incident reports from 2025 with semi-structured interviews with 12 purposively selected guides who had handled or witnessed incidents. Data were organized using the 4M framework: man, machine, material, and method/management. Material factors accounted for 22 report classifications and 20 interview mentions, followed by man factors with 17 classifications and eight mentions. Machine factors appeared in six reports and no interview mentions. No method/management factors appeared in the frequency summary, although interview narratives identified communication and warning-sign weaknesses. Interview mentions were not treated as additional incidents. Guide preparedness involved safety knowledge, preventive briefings, first aid, and reporting, but access to formal training varied. The findings support coordinated improvements in destination infrastructure, risk communication, equipment checks, and recurring guide training. These priorities offer a context-specific basis for safer shore excursion operations rather than a causal estimate of incident risk.

Keywords: shore excursion, tour guide preparedness, safety risk management, 4M approach

A. Introduction

Cruise tourism connects travel at sea with visits to destinations along an itinerary. Thano and Thano (2019) describe how port infrastructure supports cruise tourism development, while Sun et al. (2019) examine passengers' satisfaction with their shore experience. During port calls, passengers can join shore excursions, which are optional destination tours offered as part of the cruise experience (Samarathunga, 2016). These activities bring tourists into contact with unfamiliar routes, facilities, and physical environments, making safety management an important part of excursion delivery.

In Bali, shore excursions connect cruise passengers arriving at Benoa Port with cultural and natural attractions. Artha et al. (2024) examine the quality of a shore excursion product in this setting, illustrating the importance of destination-based experiences to cruise passengers. Research on public transportation in Bali also identifies infrastructure and service conditions as important to tourist satisfaction (Aryasih et al., 2024). For excursion operators, the practical challenge is to coordinate transport, destination visits, and passenger assistance within the limited duration of a port call.

The operator examined in this study is referred to as Company A, a pseudonym used to protect the research organization's identity. Its shore excursions involve tour guides, drivers, destination providers, and port personnel. The Cruise Department's figures reproduced in the source thesis (Table 4.2, p. 41) show 15,259 participants in 2023, 18,408 in 2024, and 21,844 in 2025. Table 1 presents the adult and child counts underlying these totals. These figures describe the scale of operations; they do not establish that the likelihood of an incident increased.

Table 1. Shore excursion participation, 2023–2025

Year	Adults	Children	Total participants
2023	15,241	18	15,259
2024	18,213	195	18,408
2025	21,636	208	21,844
Total	55,090	421	55,511

Source: Cruise Department records (2025)

The company recorded 45 incident reports during 2025. Examples of reported incidents include: (1) a guest slipping on a wet step, (2) slipping on the stairs, and (3) slipping on an uneven surface. These cases indicate that physical conditions at destinations may contribute to safety risks during shore excursions. They also raise questions about how guides identify hazards, communicate precautions, and respond when an incident occurs.

Previous studies have identified several dimensions of tourist safety. Kusumawardhani (2019) discusses risks associated with infrastructure, accessibility, human resources, maintenance, the environment, finance, and

regulation. Oktaviarni (2018) examines the protection of tourists, while Dewi et al. (2025) highlight infrastructure challenges in safety policy in Bali. Together, these studies suggest that safety depends on both destination conditions and the organization of tourism services.

Tour guides interpret destinations and manage interactions throughout tourism activities (Tsaur & Teng, 2017). They also prepare for risks and respond to unexpected events in the field, as illustrated by Kalyoncu Yolaçan (2024). However, studies of perceptions, service quality, and guide training do not necessarily explain the circumstances documented in operational incident reports. This study addresses that gap by comparing recorded incidents with guides' accounts of hazards and preparedness in a shore excursion setting.

The study therefore aims to identify incident-related factors through the 4M framework (man, machine, material, and method/management) and examine tour guide preparedness in safety risk management. Its contribution is a context-specific account of how documented hazards relate to the preventive and response practices described by guides.

B. Literature Review

Tourist Safety and Incident Risk

Gusthia (2022) describes an incident as an undesirable event with the potential to cause injury or illness. In this study, the term refers to the events documented in the operator's incident reports and discussed by interviewees; it is not used as a synonym for every potential hazard. Boleng et al. (2025) identify environmental conditions, equipment problems, and tourist health as relevant concerns in marine tourism. Their findings indicate that risk assessment needs to consider the interaction between visitors, operational practices, and the activity environment.

A structured framework helps distinguish these interacting sources of risk. Bowo et al. (2020) use the 4M categories to organize accident-related factors in maritime operations. The present study applies this framework to shore excursions, with material representing destination surfaces and environmental conditions, machine representing transport and equipment, man representing human behavior and capability, and method/management representing procedures and coordination. These operational definitions support consistent interpretation within the present setting.

4M Approach in Incident Analysis

The 4M framework offers a way to organize incident descriptions without assuming that an event has only one underlying cause. Bowo et al. (2020) emphasize relationships between factors, while Favi et al. (2017) demonstrate the use of 4M in examining operational processes. Their applications are outside land-based tourism, so the categories require contextual adaptation. Here, the framework is used as a qualitative coding structure rather than as a validated predictive model. Xie et al. (2021) provide a complementary

perspective through their work on perceived tourist safety; perceptions of safety and documented incident circumstances remain distinct forms of evidence.

Tour Guide Preparedness in Safety Risk Management

Tour guiding combines interpretation, interpersonal communication, logistical coordination, and responses to unexpected situations. Kalyoncu Yolaçan (2024) identifies pre-tour preparation, flexibility, and crisis management as important elements of guides' risk management experiences. In shore excursions, these responsibilities are shaped by unfamiliar destinations, varied passenger needs, and the requirement to return to the ship on time.

Guides also support occupational safety and health (OSH) through preventive information and supervision. Wiratami and Bhaskara (2018) discuss safety practices in adventure tourism, including instructions before visitors participate in an activity. Such practices are relevant to shore excursions because visitors need to understand route conditions, steps, slippery surfaces, and the physical demands of planned activities.

Preparedness includes the knowledge and skills needed to anticipate hazards, respond to incidents, and coordinate further assistance. Runtunuwu et al. (2019) examine education, training, and work experience in relation to guide service performance. More specifically, Madyaningrum et al. (2025) highlight briefing, supervision, and training in snorkeling safety. Although snorkeling differs from land-based excursions, these studies provide a basis for examining training, OSH knowledge, and incident-handling skills in the present study.

C. Research Methods

This study used a qualitative descriptive design to examine safety risks and guide preparedness in Company A's shore excursions in Bali. Qualitative content analysis organized incident descriptions and interview narratives into categories and themes, following the systematic interpretation described by Shava et al. (2021). The incident reports covered 2025, and the interview transcripts record face-to-face interviews between March 29 and April 16, 2026.

Participants and Data Sources

Twelve tour guides were selected purposively because they were involved in the operator's shore excursions and had handled or witnessed tourist incidents. Their direct operational experience enabled them to describe incident circumstances, briefing practices, equipment checks, and emergency responses. The sample included eight men and four women aged 24–67, with reported starting years in tour guiding ranging from 1980 to 2023. The document dataset comprised 45 incident reports recorded by the Cruise Department in 2025. The sample was intended to provide relevant experience rather than statistical representation of all tour guides. Interviewees are identified as TG01–TG12, and tourist names are omitted.

Instruments

A study-specific semi-structured interview guide was used with all 12 guides. The question list in Appendix 3 of the source thesis contains 26 numbered entries, including a repeated final recommendation question. The source question list presents questions formulated around the 4M categories and guide preparedness; it does not identify an adopted standardized questionnaire or report instrument validation. Follow-up prompts were used to explore participants' experiences, consistent with Roberts (2020). Incident report documents provided a separate record of events, their circumstances, and the assistance described after an incident.

Questions 1–5 addressed previous incident experience, common incident types, perceived causes, and conditions at the time of an event. Questions 6–8 addressed behavior, physical limitations, and guide communication; Questions 9–12 addressed procedures and briefings; Questions 13–14 addressed destination conditions; and Questions 15–16 addressed transport and equipment. Questions 17–20 addressed safety knowledge, prevention, training, and emergency supplies; Questions 21–24 addressed response procedures, first aid, and reporting; and Questions 25–26 requested recommendations. Table 2 defines the categories used to organize the evidence.

Representative prompts were: "What usually causes these incidents?"; "Under what conditions do they occur?"; "Have road, stair, infrastructure, or terrain conditions contributed to an incident?"; "Do you brief tourists before the tour, and what do you explain?"; and "What is your first action when an incident occurs?" These English translations correspond to Questions 4, 5, 14, 11, and 22 in the source interview guide.

Table 2. Operational definitions of the 4M categories

4M category	Operational definition	Examples in this study
Man	Human behavior, capabilities, and responses relevant to an incident.	Attention, age, physical condition, guide communication.
Machine	Condition and function of transport or operational equipment.	Buses, bicycles, brakes, and other equipment.
Method/ management	Procedures, coordination, and communication used to prevent and respond to incidents.	Briefings, route warnings, operating procedures, and reporting.
Material	Physical destination and environmental conditions encountered during an activity.	Wet steps, uneven paths, mud, weather, and handrails.

Source: Authors' operational adaptation of Bowo et al. (2020), Favi et al. (2017)

Data Analysis

The analysis involved reading the incident descriptions and interview transcripts, identifying passages about incident circumstances, and grouping them under the four operational categories. The frequency summary in the source thesis was then used to describe report classifications and interview mentions separately. Interview passages on preparedness were organized into training, OSH knowledge, and incident-handling skills. Descriptive comparisons examined where the sources converged or differed, with selected quotations used to illustrate the themes. Translated interview excerpts are identified as such; incident descriptions are paraphrased and anonymized.

The 45 report classifications and 28 interview mentions use different denominators. No case-level matching between the two sources was documented, and no statistical inference or inter-coder reliability estimate is claimed. The zero method/management frequency is interpreted alongside narratives describing procedural concerns. This approach preserves the source counts while making their evidential limits explicit.

D. Result and Discussion

The findings combine the profile of the 12 interviewees, the distribution of 4M codes, and guides' accounts of prevention and response. Table 3 reports participant characteristics from the interview transcripts. The experience column identifies the year in which each participant began tour guiding; these values are not durations in years.

Table 3. Profile of tour guide informants

Code	Gender	Age (years)	Year tour guiding began	Role
TG01	Male	66	1987	Tour guide
TG02	Male	24	2023	Tour guide
TG03	Female	51	2010	Tour guide
TG04	Male	55	1992	Tour guide
TG05	Female	30	2020	Tour guide
TG06	Male	67	1980	Tour guide
TG07	Female	56	2001	Tour guide
TG08	Male	57	1989	Tour guide
TG09	Male	54	2000	Tour guide
TG10	Male	40	2006	Tour guide
TG11	Male	59	1989	Tour guide
TG12	Female	49	1997	Tour guide

Source: Data processed by the researcher (2025)

Incident-Related Factors in the 4M Framework

The report classifications and interview mentions describe different units of analysis. The reports concern 45 recorded events in 2025; the interviews provide retrospective accounts and broader observations from 12 guides. A

guide could mention more than one factor. The source material does not provide an event-level linkage between every interview account and the incident register, so overlap cannot be resolved. The interview mentions must therefore not be interpreted as additional incidents or independent confirmation of every report.

Table 4 retains the frequencies reported in the source thesis, while distinguishing report classifications from interview mentions. The combined figures are arithmetic sums of codes from the two sources and are not counts of unique incidents or affected tourists.

Table 4. Frequency of 4M codes by data source

4M category	2025 report classifications	Interview mentions	Combined codes*
Man	17	8	25
Machine	6	0	6
Method/ management	0	0	0
Material	22	20	42

Source: Data processed by the researcher (2025)

Material factors were most frequent within each source: 22 of 45 report classifications and 20 of 28 interview mentions. Man factors accounted for 17 report classifications and eight interview mentions, while machine factors appeared in six reports and no interview mentions. No method/management factor appeared in the frequency summary. These descriptive counts identify the categories most often recorded or mentioned; they do not estimate causal effects or population-wide incident rates.

Material Factors

Material factors concerned the physical environment, including slippery surfaces, uneven steps, muddy paths, and inadequate handrails. The prominence of these conditions is consistent with Kusumawardhani's (2019) discussion of infrastructure and environmental risks. Dewi et al. (2025) likewise identify infrastructure challenges in Bali's tourism safety policy. The present study adds event-based and interview evidence showing how such conditions are encountered during shore excursions.

Guides described particular hazards rather than providing an independent infrastructure audit. TG11 reported a fall on wet stairs and expressed concern about variations in destination infrastructure. This account illustrates the participant's experience and should not be read as a verified assessment of compliance with international standards.

In general, Bali's infrastructure has not yet met international standards, although some places are fairly good. Recently, at [a village attraction], a guest slipped on stairs during the rainy season and fell, with scratches and slight bruising on the right hand. (TG11, April 16, 2026; translated from Indonesian)

The incident register also records falls on wet or muddy surfaces. For example, one tourist slipped while returning to the bus from a palace attraction and sustained a bleeding injury to the left foot. Another slipped on wet stairs while going to a buffet lunch and sustained a minor knee injury (incident reports, 2025). These accounts are paraphrased to improve clarity and remove identifying details.

The findings suggest that infrastructure quality supports safety as well as access and convenience. Aryasih et al. (2024) discuss the importance of transportation and infrastructure to the visitor experience in Bali. In the present case, uneven steps and slippery paths indicate a practical need for route assessment before groups enter a destination. The evidence supports attention to these specific hazards without establishing that all destinations share the same deficiencies.

The operator, destination managers, and transport providers should coordinate inspections of frequently used routes, particularly after rain. This recommendation complements the environmental monitoring described by Boleng et al. (2025) in marine tourism, although the hazards here are predominantly on land. Appropriate measures include identifying safer walking routes, improving handrails and surface conditions, and briefing visitors at the point where a hazard is encountered.

Man Factors

Human-related factors included distraction, limited awareness of surroundings, physical limitations, and responses to instructions. These factors should be interpreted in relation to the demands of the route rather than as evidence that tourists alone are responsible for incidents. Guides also influence how hazards are communicated and how activities are adjusted to the group. This interpretation is consistent with the emphasis on preparation and flexibility in Kalyoncu Yolaçan (2024).

Two participants described tourist awareness and physical condition as relevant concerns:

> *"Most often, guests are not aware of their surroundings." (TG02, March 29, 2026; translated from Indonesian)"*
>
> *"The causes are carelessness, lack of focus, and tourists' physical limitations." (TG10, April 16, 2026; translated from Indonesian)"*

The incident reports provide related examples. One tourist became distracted by the view and slipped on stairs. Another tripped over their own feet, fell forward, and sustained an arm fracture and bruising to both knees (incident reports, 2025). These descriptions identify circumstances recorded after the events; they do not independently establish the relative contribution of behavior, health, or route design.

Yao et al. (2026) examine human factors through an integrated framework in yachting accidents. Although that operational setting differs from shore excursions, it reinforces the value of examining human behavior within a wider safety system. In this study, the practical implication is to adapt pacing,

supervision, and route information to visitors' capabilities while addressing the environmental conditions that make a lapse in attention consequential.

Machine Factors

Machine factors accounted for six report classifications, although none appeared in the interview frequency summary. This difference is important: participants' limited recollection of equipment problems cannot invalidate events recorded in the incident dataset. The category concerns transport and equipment conditions, but the available summary does not establish that every machine-coded incident involved a mechanical failure.

Interviewees described cycling incidents that they associated with road conditions or sudden braking rather than equipment malfunction. These accounts help explain why machine factors were not prominent in their responses:

> *"So far, there have been none caused by the vehicle itself. In cycling tours, incidents are usually due to road conditions." (TG05, March 29, 2026; translated from Indonesian)"*
>
> *"I have seen incidents during cycling tours, but have not experienced one directly myself. Most involved potholes or guests braking suddenly, then falling and getting scratches." (TG12, April 16, 2026; translated from Indonesian)"*

These statements indicate a difference in emphasis between the sources, rather than proving that transport and equipment were safe in all cases. Lugijana et al. (2025) discuss equipment and safety practices in marine tourism. Their context differs, but the continuing need for inspection remains relevant when adapting preventive measures to buses, bicycles, and supporting equipment used in shore excursions.

Guides distinguished their preliminary checks from the technical inspections undertaken by transport vendors. TG02 described checking cleanliness, microphones, and other operational requirements before departure. TG09 described checking bicycle brakes, bells, and related equipment before cycling activities, while leaving bus mechanical inspections to the transport provider (interviews, March 29 and April 15, 2026).

Ardiansyah and Arifin (2024) emphasize inspection of vehicle documents, technical condition, equipment, and cleanliness in tourism transport. Applied to this case, inspection responsibilities should be explicit and documented. Guides' pre-departure checks can complement vendor inspections, but the accounts do not show that guides carried out specialist mechanical assessments.

Method or Management Factors

No method/management codes were reported in the source frequency table. However, the interview narratives include examples involving missing warning signs and insufficient communication of unsafe routes. The zero count should therefore be read as a feature of the original frequency summary, not as proof that management practices were fully effective or unrelated to incidents.

This distinction matters because an environmental hazard can also reveal a weakness in how risk information is provided. TG02 described a visitor entering a slippery, poorly maintained route without a warning sign. TG04 described a similar situation involving inadequate information about a route that should have been avoided. These narratives raise procedural issues even though the source summary assigned no codes to method/management.

> *"A guest entered a route because there was no warning sign or information saying that it should not be used. When we checked, the path was slippery and poorly maintained." (TG02, March 29, 2026; translated from Indonesian)"*

The material and method categories can therefore overlap conceptually: the slippery path is a physical hazard, while the missing warning concerns communication and control. Bowo et al. (2020) support interpreting 4M factors as related components. The original frequencies are retained for traceability, but a future analysis should make primary and secondary coding rules explicit and record multiple contributing factors where the evidence supports them.

Taken together, the results indicate that prevention requires attention to physical conditions, tourist capabilities, equipment readiness, and the communication of risks. Frequency alone does not establish priority: a less frequently reported equipment or procedural problem may still have serious consequences. Guide preparedness must therefore address the full range of plausible hazards rather than only the most common category.

Tour Guide Preparedness in Safety Risk Management

Preparedness was reflected in three themes: safety-related training, OSH knowledge, and incident-handling skills. Some guides described professional certification and first aid training, while others reported learning independently. Certification, course attendance, and demonstrated emergency competence are distinct; the study did not independently test participants' skills or verify that every professional certificate included first aid training.

TG04 reported that many guides held professional certification associated with the National Professional Certification Agency (BNSP). This account concerns professional certification and should not be treated as a verified count of first aid qualifications (interview, March 29, 2026).

> *"At certain times, we are sent to learn first aid. That is where we learn how to provide first aid following an accident." (TG11, April 16, 2026; translated from Indonesian)"*

Access to formal training was uneven. TG06 reported learning independently rather than attending a formal program. This variation suggests that operational experience may support individual preparedness while leaving differences in how guides acquire and refresh safety skills.

> *"I have never had formal training; I learned by myself." (TG06, March 29, 2026; translated from Indonesian)"*

This finding extends the training issue beyond whether a program is available to whether guides can participate consistently. Darmawan et al. (2023) describe safety management training for local guides and tour operators on Tidung Island. Madyaningrum et al. (2025) identify briefing, supervision, and

relevant training in snorkeling operations. In comparison, the present findings reveal uneven access within a shore excursion setting, supporting recurring training with records of participation and practical assessment.

Guides also described prevention through knowledge of destination conditions and clear briefings. These practices connect general safety knowledge to the route that tourists are about to encounter. The briefing and visitor-management emphasis is consistent with the guide education discussed by Satriawati et al. (2025).

> *"Before the tour starts, we always remind guests about access, the terrain, and ground conditions." (TG02, March 29, 2026; translated from Indonesian)"*

TG04 described assessing destination conditions and communicating precautions before activities. Such accounts support the importance of preparation, but they remain self-reported practices rather than a direct observation of every briefing (interview, March 29, 2026).

Incident handling included assessing the situation, providing assistance within the guide's competence, communicating with the company, and arranging further help when needed. One 2025 report describes first aid after a cycling injury and a tourist declining the offer of a medical consultation. This is evidence of a recorded response, not a basis for evaluating the clinical appropriateness of that response.

> *"The first thing I do is assess the guest's condition. I then provide first aid and report the situation. If the case is serious, we should contact the hospital, because medical treatment is not our profession." (TG11, April 16, 2026; translated from Indonesian)"*

Written incident reports and communication with the Cruise Department provided a record of what had happened and the assistance offered. These arrangements are consistent with the proactive planning and coordination discussed by Kalyoncu Yolaçan (2024). The added implication of the present study is that reporting should also support learning: recurring hazards can be reviewed with destination and transport providers to inform later tours.

Overall, the evidence indicates practical preparedness but does not justify a uniform rating of all guides as adequately trained. Standardized briefings, recurring training, and clearer escalation responsibilities would help make preparedness more consistent. The study is limited to one operator, 45 reports from one year, and retrospective interviews. Reporting completeness, overlap between sources, coding reliability, and observed competence were not independently established. The findings are therefore context-specific and should not be generalized as causal estimates for all cruise excursions.

E. Conclusion

Material and human-related factors were the most frequent categories in the 2025 reports and the guides' interview accounts. Slippery surfaces, uneven steps, visitor attention, and physical limitations were recurring concerns. Equipment-related factors appeared in the reports despite being absent from the interview frequency summary. Procedural weaknesses also appeared in

interview narratives despite a zero method/management count, showing why the numerical summary requires contextual interpretation.

Company A should coordinate route inspections with destination managers, communicate hazards at the point of exposure, and adapt activities to visitors' mobility and condition. Transport providers and guides should document their respective inspection responsibilities. Recurring first aid and incident-response training, practical assessment, and participation records are recommended to address uneven access to training. Future research should link interview accounts to individual reports where possible, clarify multiple-factor coding, and compare more operators and years to examine the transferability of these findings.

F. Acknowledgement

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G. Conflict of Interest

The authors confirm that there are no conflicts of interest associated with the preparation and publication of this article. The study was developed as an independent academic investigation into safety-related factors and tour guide preparedness in shore excursion activities. The use of Company A as the research setting did not involve any financial arrangement or personal interest that could influence the selection, examination, or interpretation of the research evidence. The authors have maintained academic impartiality throughout the study and take responsibility for the integrity of the findings presented.

H. Declaration of AI Use

In developing this manuscript, the authors used ChatGPT (OpenAI) to support the formulation of the research framework. The assistance focused on structuring the conceptual foundation of the study and examining how the 4M framework (man, machine, material, and method/management) could be related to safety risks and tour guide preparedness in shore excursion operations. The tool's suggestions were treated as preliminary references and were critically reviewed and adjusted by the authors to ensure consistency with the research context, theoretical perspectives, and relevant scholarly sources. ChatGPT did not generate the incident records, conduct interviews, classify the empirical data, or determine the research findings. Responsibility for the research design, data analysis, interpretation, and conclusions rests entirely with the authors.

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