Received: October 06, 2025 Homepage: http://trj.stptrisakti.ac.id/index.php/trj/index
Accepted: October 07, 2025 DOI: https://doi.org/10.30647/trj.v9i2.293
Published: October 12, 2025

Tourism Research Journal
E-ISSN: 2598-9839
2025, Vol. 9 No. 2

Evaluating Hazard Public Signs at Nusa Penida Tourist Sites for Visitor Safety

I Gusti Ngurah Agung Suprastayasa[1*], I Wayan Sunarsa[2], Putu Gde Eka Darmaputra[3], I Gusti Ngurah Agung Wiryanata[4], Ketut Rusdiarnata[5]

[1]*Program Studi Pengelolaan Konvensi & Acara, Politeknik Pariwisata Bali*
[2,3] *Program Studi Divisi Kamar, Politeknik Pariwisata Bali*
[4]*Program Studi Manajemen Akuntansi Hospitaiti, Politeknik Pariwisata Bali*
[5]*Program Studi Tata Hidang, Politeknik Pariwisata Bali*

[*]*agung.suprastayasa@ppb.ac.id*

Abstract

Public hazard signs are a critical component of tourism safety management. This research therefore aims to investigate the adequacy and effectiveness of public hazard signage at key tourist locations in Nusa Penida Island. Data are collected by questionnaire to tourists, interviews to tourists, local community and government officials and are analyzed qualitatively. The results showed that hazard signs were available in some major tourist spots, yet their number and distribution remained limited and uneven. Many signs were placed in less strategic locations such as parking areas rather than at high-risk zones, reducing their visibility and preventive function. The design and language of the signs were often text-heavy and primarily in Indonesian, with minimal use of international symbols, making them less effective for foreign visitors. Furthermore, most signs only provided general warnings without clear preventive instructions, while their physical condition in many places was poor due to lack of regular maintenance. The implications of these findings suggest the urgent need for improving the quality, placement, and maintenance of hazard signage in Nusa Penida. Collaborative efforts between local government, community, and tourism stakeholders are essential to develop standardized, multilingual, and internationally recognizable signs. Strengthening signage infrastructure will not only enhance visitor safety but also contribute to the sustainable development and positive image of Nusa Penida as a tourism destination.

Keywords: hazard, Nusa Penida, public sign, safety and security

A. Introduction

Tourism in Indonesia has grown significantly over the past decade, with destinations like Bali and its surrounding islands experiencing a surge in visitor numbers. Among these islands, Nusa Penida has emerged as one of the most sought-after travel destinations, attracting both domestic and international tourists with its dramatic coastal cliffs, crystal-clear waters, and unique marine biodiversity. Tourists flock to the island for its natural beauty, popular dive sites, and adventure activities like cliff- jumping and hiking. However, the very features that make Nusa Penida appealing also present significant safety risks to travelers.

The island's terrain is rugged, and many of its popular tourist sites are located in remote or undeveloped areas. Steep cliffs, dangerous ocean currents, and rapidly changing weather conditions all contribute to potential hazards. Despite the growing number of visitors, there is a growing concern that the safety infrastructure, specifically public hazard signage may not be sufficient to effectively warn tourists of these dangers. Incidents of accidents, injuries, and even fatalities have been reported over the years (Detik Bali, 2023), indicating the need for a more systematic approach to risk management in the area.

Public hazard signs are a critical component of tourism safety management, particularly in natural environments where risks can be unpredictable or difficult for visitors to assess. In addition, security and safety are major issues for the majority of tourists, especially those from foreign countries (Arowosafe, Oni, & Tunde-Ajayi, 2023; Spencer & Tarlow, 2021; Wang et al., 2019). Such signage serves to inform, warn, and guide tourists, especially those unfamiliar with the island's geography, weather, and ocean conditions. Effective hazard signage is not only about the presence of signs but also concerns their visibility, placement, design, language, and cultural sensitivity. Tourists come from diverse backgrounds, speak different languages, and may have varying levels of risk awareness. As such, the design and messaging of public signs must be accessible to a broad audience.

Studies on hazard signs have received relatively little scholarly attention, particularly in tourism settings. Existing research includes investigations into the use and effectiveness of hazard warning signs (Espiner, 1999; Saunders et al., 2019; Lai, et al., 2025); the relationship between volcanic risk and the tourism sector in southern Iceland, highlighting the complex challenges faced by emergency management officials in developing effective volcanic risk mitigation strategies (Bird et al., 2010); tsunami hazard signage in beach tourism areas (Rezaldi & Soewardikoen, 2016); and visitors' perceptions of natural hazards at tourism attractions in New Zealand, which revealed that hazard perception among some international visitors is low, and that alternative hazard sign designs may help increase hazard awareness and reduce inappropriate risk behaviors (Espiner, 2001).

Despite these contributions, most studies focus on specific hazard types or particular geographic contexts, with limited attention to how hazard signage functions in small island tourism destinations experiencing rapid post-pandemic

visitor growth. This highlights a significant research gap concerning the adequacy, visibility, and effectiveness of hazard signs in such high-risk and high-traffic tourism environments.

In Nusa Penida, the effectiveness of public hazard signage is crucial in reducing the risk of accidents, particularly in high-risk areas such as Angel's Billabong, Kelingking Beach, and Broken Beach, where steep cliffs and unpredictable tides pose significant dangers. Reports from both tourists and local authorities suggest that in some areas, signs may be insufficient, poorly maintained, or lacking altogether. Additionally, the effectiveness of the signs in communicating risk to international visitors, who may not understand local language or norms, is a significant concern. This research, therefore, aims to evaluate the adequacy and effectiveness of public hazard signage at key tourist locations in Nusa Penida.

B. Literature Review

Research on hazard management in tourism destinations emphasizes the importance of identifying potential risks and implementing effective mitigation strategies to ensure visitor safety. Common hazards in tourism areas include natural phenomena such as rip currents, volcanic activity, earthquakes, and extreme weather events (Muthiah et al., 2018; Mar'atusholihah et al., 2021). Effective hazard management requires comprehensive risk assessment, the establishment of early warning systems, and active collaboration among stakeholders (Muthiah et al., 2018).

One of the most important strategies in risk mitigation is enhancing visitor awareness through interpretive media, installation of hazard warning signs, and educational programs (Muntasib et al., 2018; Mar'atusholihah et al., 2021). In small island destinations such as Nusa Penida, vulnerability to natural hazards is relatively high due to challenging geographical conditions and limited infrastructure. Consequently, the involvement of local communities, government authorities, and tourism industry stakeholders is essential for providing adequate safety facilities, including effective hazard warning signage (Kennedy et al., 2020).

According to Spencer and Tarlow (2021) and Wang et al. (2019), safety and security are among the primary factors influencing tourists' overall experience and satisfaction, particularly for international visitors. Hazard warning signs play a vital role as a rapid and easily accessible medium for risk communication, enabling tourists to make informed decisions without over-reliance on guides or local assistance.

The effectiveness of hazard signage is determined not merely by its existence but by several key factors. These include: visibility and strategic placement, whereby signs must be located in areas directly associated with potential hazards and be clearly noticeable before tourists enter high-risk zones (Chan & Wong, 2019); design and readability, which entails the use of clear visual layouts, internationally recognized symbols, and easily understandable language to ensure accessibility across diverse cultural and linguistic

backgrounds (ISO 3864:2011); completeness of information, meaning signs should clearly specify the type of hazard, its risk level, and the preventive measures to be taken (Wilkinson, 2020); and maintenance, ensuring that signs remain in good physical condition and that their information is updated regularly to maintain relevance and legibility (Mar'atusholihah et al., 2021).

Research by Ballantyne et al. (2018) further indicates that tourists are more likely to underestimate risks if signs fail to attract attention or if the messages are perceived as overly generic. This underscores the importance of designing hazard signage that is both contextually appropriate and location-specific. Given these considerations, evaluating the availability, placement, readability, and informational completeness of hazard signage in tourism destinations such as Nusa Penida is highly relevant. Enhancing the quality of such signage has the potential to reduce the incidence of tourist accidents, improve overall safety, and reinforce the destination's positive image.

C. Research Methodology

This study uses a case study and descriptive design (Dudovskiy, 2018). The case study approach was chosen to investigate and analyze in depth the conditions and effectiveness of hazard warning signs in certain tourist sites in Nusa Penida. Descriptive design is used to describe the existing conditions related to the availability, placement, readability, and completeness of information on signs, as well as to identify factors that affect their effectiveness. The descriptive approach is considered so as to interpret what exists and why (Payne & Payne, 2004).

The study informants include domestic and foreign tourists visiting Nusa Penida, local people living around tourist sites, and relevant local governments. They are determined using the purposive sampling technique, which is to select respondents who have direct experience related to the use or observation of hazard warning signs at tourist sites. The research location includes several popular tourist sites that have high risk levels, such as Angel's Billabong, Kelingking Beach, and Broken Beach, Guyangan Water fall, Goa Giri Putri (cave), and other tourist sites.

Data was collected through 1) questionnaires distributed to tourists to assess perceptions of the existence, placement, readability, and completeness of hazard signs; 2) semi-structured interviews with tourists, local communities, and government officials to gain a more in-depth perspective; and 3) field observations to record the actual condition of the warning signs, including the placement location, physical condition, language used, and visual design.

The collected data was analyzed qualitatively with a descriptive approach. The analysis was carried out by grouping information based on indicators of the effectiveness of the signs (availability, placement, readability, and completeness of information). The results of the observations were compared with the findings of questionnaires and interviews to ensure data triangulation, so that a comprehensive picture of the effectiveness of danger warning signs in Nusa Penida was obtained.

D. Result and Discussion

Availability of Hazard Signs

The results of the study show that danger signs are available in several main Nusa Penida tourist locations, such as Kelingking Beach, Angel's Billabong, Broken Beach. However, the number of signs is still very limited and not evenly distributed across all vulnerable points. This condition causes most tourists to rely only on verbal information from tour guides or local communities to understand potential dangers. As one of the tourist guides commented that he always informed his guests to be careful at the dangerous areas:

> *"I always remind my guests to be extra careful near the cliffs and about strong waves when they swim. Sometimes tourists don't realize the danger until I point it out to them."* (Tour guide, interview, September 2025)

The limited number of danger signs shows that there is a gap between the growth in the number of tourists and the readiness of safety infrastructure. These findings are in line with research by Kennedy et al. (2022) who stated that small island destinations often face high vulnerability to natural hazards, while safety infrastructure support is often inadequate. Moreover, the trend of "*revenge travel*" following the pandemic may contribute to careless behavior, as tourists are frequently driven more by the urge to compensate for missed travel opportunities than by concerns for health and safety (Quan et al., 2023).

Placement and Visibility

Existing hazard signs are generally placed in parking areas (for instance in Crystal Bay) or in areas that are not at the most accident-prone points, such as paths to the beach or cliff edges. As a result, tourists do not aware of the warning until after entering the risky area. In addition, some signs are covered by vegetation or commercial boards, so visibility is low. One of the visitors said in the interview:

> "*I didn't notice any warning signs around here. Did you? When I walked down to the beach from the parking to this place, I didn't see any hazard signs*." (Visitor from India, interview at Broken Beach, September 2025)

This statement illustrates how the ineffective placement and poor visibility of hazard signs reduce their preventive function. Instead of serving as an early warning system, the signs are often encountered after tourists are already exposed to potential danger. In the context of Nusa Penida, the misplacement of signs undermines their role in risk communication and increases tourists' reliance on their own judgment or informal sources of information. This situation is particularly concerning for independent travelers who may not receive verbal warnings from guides or locals.

This non-strategic placement of signs is contrary to the recommendations of Chan and Wong (2019) who affirm that signs should be installed at points that are directly related to potential hazards and should be clearly visible before tourists enter risk areas. In addition, attention switch is more likely to happen

when signs are close to the danger, both physically and in terms of time (Wogalter, et al., 2021). The lack of effectiveness of sign placement seems to increases the likelihood of accidents.

Clarity and Design of Signs

From a design perspective, many of the existing hazard signs rely predominantly on lengthy textual descriptions without incorporating internationally standardized pictograms that can be easily interpreted by foreign tourists. This overreliance on text not only limits accessibility for non-native speakers but also contradicts best practices in risk communication, which emphasize the use of clear and concise visual symbols to ensure rapid comprehension across linguistic and cultural boundaries. In several cases, there is also an evident imbalance between written information and symbolic representation, resulting in signs that are visually cluttered or lack immediate impact.

Only a small proportion of the signs utilize simple and universally recognized icons—such as those indicating steep cliffs or drowning hazards—which are essential for conveying urgent warnings in a tourism context characterized by high visitor diversity. The absence of standardized design elements, including appropriate color schemes, proportional layouts, and universally understood pictograms, undermines the effectiveness of these signs as tools for cross-cultural risk communication. As a result, the signs may fail to alert tourists promptly to potential dangers, thereby reducing their preventive function in high-risk environments.

The ISO 3864:2011 literature emphasizes the importance of using universal pictograms to ensure the readability of signs for travelers from different language and cultural backgrounds. The results of this study are also consistent with the findings of Ballantyne et al. (2018), which emphasize that tourists tend to ignore danger messages if the signs are not attractively designed or difficult to understand. A study by Zhong et al. (2025) suggests that tourists' safety behavior can be improved by aligning safety sign shapes with appropriate persuasive appeals, thereby enhancing destination safety.

Completeness of Information

The majority of hazard signs provide only generic warnings, such as symbols such as "Danger of big waves" or "Beware of steep cliffs," without offering more detailed information regarding the level of risk or specific preventive actions that tourists should take. This lack of comprehensive and actionable content leads to ambiguity and limits tourists' ability to make informed decisions when encountering hazardous conditions. As Wilkinson (2020) notes, the effectiveness of warning signs depends not only on the clarity of the warning itself but also on the inclusion of explicit and practical instructions that guide individuals toward appropriate preventive behavior. In the context of tourism, where visitors may have limited local knowledge and varying levels of risk perception, the absence of such instructions can

significantly undermine the protective function of signage. These findings highlight the need to improve sign content so that it not only communicates danger but also provides clear, behavior-oriented guidance to support anticipatory action by tourists.

Maintenance and Physical Condition

Field observations indicate that several hazard signs are in poor physical condition, with some showing signs of fading, rusting, or even collapse. Inadequate maintenance has significantly reduced the visibility and legibility of these signs, thereby diminishing their capacity to communicate danger effectively. Interviews further reveal that maintenance efforts are not undertaken regularly. One informant even stated: "… it was never maintained since the first time it was placed here …". It suggests a lack of institutional responsibility and systematic upkeep. One notable example was observed at Broken Beach, where a hazard sign was almost entirely covered with stickers placed by visitors, rendering the warning message unreadable. This situation reflects not only insufficient maintenance but also inadequate monitoring and enforcement mechanisms, which collectively undermine the overall effectiveness and credibility of hazard communication in the area.

These findings also show the weak institutional coordination in the management of safety infrastructure in tourist destinations. Mar'atusholihah et al. (2021) emphasized that regular maintenance of signs is an important factor in ensuring the readability and relevance of safety messages. Therefore, a more structured and sustainable routine monitoring system is needed.

F. Conclusion

This study highlights the condition of danger signs in major tourist destinations in Nusa Penida which still face various limitations. Based on the results of observations, questionnaires, and interviews, several things can be concluded. The availability of danger signs is still limited and not evenly distributed in accident-prone points. The placement and visibility of signs are not yet strategic, with most signs being installed far from immediate risk areas. The design and language of the signs are less effective because of the lack of international symbols and the dominance of local texts, making it difficult for foreign tourists. The completeness of the information is still low; Signs are generally just general warnings without clear precautionary instructions. The maintenance of the signs is not optimal, with the physical condition fading, damaged, or closed, and more maintenance carried out by the local community than by the official authorities.

Overall, the effectiveness of danger signs in Nusa Penida is still low in providing optimal protection for tourists. This condition shows the need for serious attention from local governments and tourism stakeholders in order to strengthen tourism safety infrastructure. Based on the results of the study, some practical recommendations are proposed that can be used as a reference for policymakers and destination managers: (1) Increasing the availability of signs,

namely increasing the number of danger signs at all vulnerable points, including steep cliff areas and large choppy beaches. Provide portable signs at locations with seasonal risks; (2) Strategic Placement and Visibility: Placing signs before tourists enter the danger area. Ensure the signage is free of obstructions and use contrasting colors to make it easy to see; (3) Design and Language Improvements: Adopt international pictograms as per ISO standards to facilitate cross-cultural understanding. Provides concise text in dual language (Indonesian–English). Combine icons, warning colors, and short text to make it more communicative; (4) Improved Completeness of Information: Include clear precautionary instructions, such as a ban on swimming or a recommendation not to go over a safety fence. Include emergency numbers or first aid information; (5) Routine Maintenance and Monitoring: Establish a joint maintenance team with local governments and local communities. Conduct periodic checks at least every three months. Replace signs that are faded, damaged, or irrelevant; (6) Stakeholder Engagement: Involving tourism business actors, tour guides, and local communities in the installation and maintenance of signs. Provide education to tour guides to complement the function of signs with direct explanations to tourists. Develop destination safety standards based on multi-stakeholder collaboration.

G. Conflict of Interest

The authors have no competing interests to disclose regarding the tourism authorities, site operators, or signage providers associated with the locations examined in Nusa Penida.

H. Declaration of AI Use

At the planning stage, the authors consulted Google Gemini to explore research ideas and possible conceptual approaches to evaluating hazard signs at tourist sites. They examined the proposed concepts against original scholarly sources and the study objectives, then refined those considered relevant to the research. The authors determined the final conceptual approach and remain fully accountable for the manuscript's accuracy, originality, references, and academic integrity.

REFERENCES

Arowosafe, F., Oni, F., & Tunde-Ajayi, O. (2023). Effectiveness of Interpretative Signs on Visitors' Behaviour and Satisfaction at Lekki Conservation Center, Lagos State, Nigeria. *Czech Journal of Tourism*, 12(1-2), 50-65. DOI:10.2478/cjot-2023-0004

Badiora, A. I., Adedotun, S. B., Sobowale, T. O., & Afolabi, H. (2022). Safety and security assessment of tourist destinations: A field study in a Nigerian geopark. *Journal of Event, Tourism and Hospitality Studies (JETH)*, 2, 106-149. DOI:10.32890/jeth2022.2.5

Ballantyne, R., Hughes, K., Lee, J., Packer, J., & Sneddon, J. (2018). Visitors' values and environmental learning outcomes at wildlife attractions: Implications for interpretive practice. *Tourism Management*, 64, 190-201. https://doi.org/10.1016/j.tourman.2017.07.015

Bird, D. K., Gisladottir, G., & Dominey-Howes, D. (2010). Volcanic risk and tourism in southern Iceland: Implications for hazard, risk and emergency response education and training. *Journal of volcanology and geothermal research*, 189(1-2), 33-48. https://doi.org/10.1016/j.jvolgeores.2009.09.020

Detik Bali (2023). Marak Kecelakaan Wisatawan di Nusa Penida, Tergulung Ombak-Terperosok di Tebing. Retrieved from https://www.detik.com/bali/berita/d-6886172/marak- kecelakaan-wisatawan-di-nusa-penida-tergulung-ombak- terperosok-di-tebing.

Espiner, S. R. (1999). The use and effect of hazard warning signs. *Science for Conservation*, 108, 1-40.

Espiner, S. R. (2001). Visitor perception of natural hazards at New Zealand tourism attractions. *Pacific Tourism Review*, 4(4), 179-189.

Johnston, D., Becker, J., Gregg, C., Houghton, B., Paton, D., Leonard, G., & Garside, R. (2007). Developing warning and disaster response capacity in the tourism sector in coastal Washington, USA. *Disaster Prevention and Management: An International Journal*, 16(2), 210-216. DOI:10.1108/09653560710739531

Kennedy, V., Crawford, K. R., Main, G., Gauci, R., & Schembri, J. A. (2022). Stakeholder's (natural) hazard awareness and vulnerability of small island tourism destinations: A case study of Malta. *Tourism Recreation Research*, 47(2), 160-176. https://doi.org/10.1080/02508281.2020.1828554

Lai, F., Xie, C., Chen, Y., & Huang, R. (2025). Humor or Fear: Which Tourism Warning Message Appeals are More Persuasive. *Journal of Travel Research*, 00472875251361906. DOI:10.1177/00472875251361906

Payne, G., & Payne, J. (2004). *Key concepts in social research*. Sage Publisher

Quan, W., Jang, J., Radic, A., Ariza-Montes, A., & Han, H. (2023). Safe Destination Choice Among Tourism-Product Consumers in the New Era of Tourism. *Sage Open*, 13(4),. https://doi.org/10.1177/21582440231205658

Radio Republik Indonesia (2023). Kecalakaan di Nusa Penida. Retrieved from https://rri.co.id/denpasar/daerah/307510/ marak-kecelakaan-di-nusa-penida-ini-faktanya

Rezaldi, M. Y., & Soewardikoen, D. W. (2016). Tsunami hazard signage at beach tourism area in Indonesia. *Heritage, Culture and Society*, 433-436. DOI:10.1201/9781315386980-77

Saunders, R., Weiler, B., Scherrer, P., & Zeppel, H. (2019). Best practice principles for communicating safety messages in national parks. *Journal of Outdoor Recreation and Tourism*, 25, 132-142. https://doi.org/10.1016/j.jort.2018.01.006

Spencer, A. & Tarlow, P. (2021a). Tourism security to tourism surety and well-being", Tourism Safety and Security for the Caribbean (Tourism Security-Safety and Post Conflict Destinations). *Emerald Publishing*, 15-25. DOI: 10.1108/978-1-80071-318- 520211004.

Spencer, A., & Tarlow, P. (2021b). Security and TOPPS. In Tourism Safety and Security for the Caribbean (pp. 49-60). Emerald Publishing Limited.

Tourism hazard potentials in Mount Merapi: how to deal with the risk. In IOP conference series: Earth and environmental science 149(1), p. 012020). IOP Publishing.

Wang, J., Liu-Lasttres, B., Shi, Y. & Li, T. (2019). Thirty year of research on tourism safety and security: a comparative automated content analysis approach. *Journal of China Tourism Research*, 15(3), 340–358. DOI: 10.1080/19388160.2019.1575779.

Widantara, K. W., & Mutaqin, B. W. (2024). Multi-hazard assessment in the coastal tourism city of Denpasar, Bali, Indonesia. *Natural Hazards*, 120(8), 7105-7138. https://doi.org/10.1007/s11069-024-06506-3

Wogalter, M. S., Mayhorn, C. B., & Laughery Sr, K. R. (2021). *Warnings and hazard communications*. Handbook of human factors and ergonomics, 644-667.

Yang, T. H. (2024). The effectiveness of information signs in deterring visitor vandalism. *Journal of Outdoor Recreation and Tourism*, 45, 100731. https://doi.org/10.1016/j.jort.2023.100731

Zhong, H., Zou, Y., Hao, F., Fang, Y., & Ng, W. (2025). Shaping safety: Effective signage for tourist attractions. *Tourism Management*, 110, 105186. https://doi.org/10.1016/j.tourman.2025.105186