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Original research

The influence of risk perception and safety concerns on tourist decision planning: A case study on the post-tsunami Sunda straits

Yusraini Muharni[a,*], Elis Ratna Wulan[b], Maria Ulfah[a], Hartono Hartono[c], Ade Irman Saeful Muttaqien[a], Anting Wulandari[a]

[a]*Department of Industrial Engineering, Universitas Sultan Ageng Tirtayasa, Jl. Jend. Sudirman KM3, Cielgon 42435, Banten, Indonesia*
[b]*Department of Industrial Engineering, UIN Sunan Gunung Jati, Indonesia*
[c]*Department of Electrical Engineering, Universitas Sultan Ageng Tirtayasa, Jl. Jend. Sudirman KM3, Cielgon 42435, Banten, Indonesia*

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ABSTRACT

Risk perception directly influences tourists' involvement in trip planning, particularly in seeking information before and during their trips. Natural disasters like tsunamis can pose significant risks to tourist safety, ranging from minor injuries to severe harm and even death. This study investigates how risk perception and safety concerns influence tourists' decision-making, with a focus on post-tsunami tourism in the Sunda Straits area, which was severely impacted by the 2018 tsunami caused by the eruption of Mount Anak Krakatau. A sample of 116 domestic tourists was surveyed to understand the relationship between risk perception, safety concerns, and tourist decision planning. The results reveal that risk perception is a critical factor in shaping safety concerns and, subsequently, tourists' decisions. This research offers insights into how disaster risk management in tourism can influence recovery strategies. Practical implications include the need for improved risk communication and enhanced safety measures to restore tourist confidence in the region.

1. Introduction

The Sunda Strait, located between the Indonesian islands of Java and Sumatra, is a region with significant seismic and volcanic activity, making it prone to natural disasters such as tsunamis. A notable event occurred on December 22, 2018, when the southwest flank of the Anak Krakatau volcano collapsed, triggering a devastating tsunami. This tsunami resulted in significant loss of life and property, with over 400 deaths, 14,000 injuries, and extensive damage to coastal infrastructure.

Tsunamis are low-probability, high-impact natural disasters that have the power to destroy coastal communities and populations, leaving many people injured or dead [1]. Several safety concerns have been highlighted in the aftermath of the 2018 event, and there have been calls for improvements in early warning systems, including the installation of tidal gauges and other sensors to better detect volcanic tsunamis. Enhancing the structural resilience of buildings and infrastructure, as well as improving community preparedness and evacuation plans, are also critical measures being considered to mitigate the impacts of future tsunamis.

A previous study demonstrated that visitor numbers are frequently high in coastal cities at risk for tsunamis and that tsunami awareness can lower the perceived risk of tsunamis [2]. Studies investigating how tsunamis impact tourism decisions highlight significant declines in tourist arrivals following such disasters. The 2004 Indian Ocean tsunami, for instance, led to a sharp drop in tourism in affected regions such as Phuket, Thailand, and Indonesia [3]. This decline was due to the perceived risks and reputational damage caused by the disaster. Tourists often avoid areas recently affected by tsunamis due to safety concerns, leading to long-term economic stagnation in these regions. Recovery strategies emphasize improving safety measures, rebuilding infrastructure, and marketing efforts to restore tourist confidence. Tourism has contributed to the development and industrialization of most countries. The interdependence of international tourism with many other economic activities results in a multiplier

*Corresponding author:
Email: yusraini@untirta.ac.id

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effect visible in employment, foreign exchange, and increased overall welfare [4], [5].

Tourism is a service sector with intangible products and experiences that are vulnerable to threats and hazards, including crime, sociopolitical unrest, natural disasters, and pandemic diseases. Such susceptibility can damage a destination's reputation [5]. Tourism crises are most often caused by incidents that affect the safety, comfort, and attractiveness of the destinations. As a result of crises, there may be a drop in the local tourism industry due to a reduction in tourist arrivals [6].

Furthermore, as far as we are aware, no research has been conducted that focuses on how the perceived risk of a tsunami attack varies based on participation levels, and how this, in turn, affects foreign visitors' safety concerns. This work aims to contribute to closing this gap. In this research, we aim to examine the traveler's perception of risk as a determinant of their involvement in product purchases, considering the implications of such involvement, particularly regarding the traveler's safety concerns.

The concepts of fear and risk perception are difficult to measure, as the respective measuring instruments may lead respondents to express other types of fear, vulnerability, or powerlessness—feelings of unsafety or uncertainty about life in contemporary urban society [6]. The perceived risk that tourists associate with destinations and international travel is based on a variety of factors, ranging from their experiences, the context in which incidents occur, to how the media spread those events and keep them alive in people's minds [7].

2. Material and method

2.1. Risk perception

One of the most important considerations for travelers when choosing a destination is their sense of risk and safety [8]. In tourism, the perception of risk determines outcomes and uncertainty [9]. Factors such as travel advice about the destination released by tourist-generating countries, the destination's relationship with these countries and the international media, or the ability of the destination authorities to manage crises can all contribute to perceptions of destination risk [9]. Travelers' perceptions of danger and safety play a major role in their choice of destinations [10]. The two elements of tourism risk are "the possibility that tourists may be subject to various misfortunes on a trip or at a tourist destination," which are gradually considered complementary. According to Tsaur et al. [11], "tourists cannot determine the consequences or negative outcomes after making travel decisions."

According to [12], when travelers consider how uncertain the consequences and processes of tourism activities are, they begin to sense the risk associated with the industry. The psychological experience and understanding of how people's perceptions influence day-to-day activities and work is known as risk perception [13]. One of the most important aspects of risk communication is how risk is handled and whether it can reliably assess the threat. Two key concerns are the amplification of negative factors and the study of elements that influence risk perception. The perceived risk of a destination subsequently shapes tourists' decision-making processes. Tourists with a high perceived risk may opt for alternative, safer destinations, prioritizing their safety and security over potentially enriching experiences. Conversely, when perceived risk is low, tourists feel more comfortable proceeding with their plans, seeing the potential for enjoyable experiences as outweighing the possible risks.

2.2. Safety concerns

Coastal areas are susceptible to tsunamis, and many visitors who travel to these regions are often unaware of the potential dangers [2]. Coastal residents are becoming more conscious of the deadly potential of tsunamis [14]. Safety concerns do have an impact on perceived risk, as evidenced by various studies across different industries. In the chemical industry, workers' risk perception is influenced by safety attitudes, safety knowledge, and safety leadership, with safety attitudes and leadership directly affecting the perception of risk probability and severity [15]. Similarly, in the construction sector, risk perception is related to factors such as behavior, environment, working conditions, culture, individual and demographic factors, and knowledge, all of which can influence safety behavior and risk management efforts [10]. Moreover, the perception of risk in occupational safety and health is crucial for the success of accident prevention programs, highlighting the importance of understanding and addressing safety concerns to effectively manage risks in various work environments [4].

2.3. Tourist decision planning

Tourist decision planning in highly tsunami-prone tourism areas involves various strategies to mitigate risks and ensure visitor safety. Studies emphasize the importance of collaboration between emergency management officials and tourism agencies to reduce risks for tourists [2]. Implementing protective infrastructure, such as seawalls, and regulating land use are recommended but can be challenging in coastal tourism areas due to economic concerns [16]. Research on the Paal Beach area in Indonesia highlights the need for adequate infrastructure and disaster adaptation planning to address the significant tsunami risk in tourist regions [3]. Additionally, in North Norway, efforts are needed to ensure that both residents and tourists are well-informed about tsunami risks and evacuation procedures to enhance overall safety and preparedness. Choosing an appropriate vacation destination that aligns with the tourist's self-image is vital in determining the choice of destination [17].

2.4. Conceptual model

In 2018, a tsunami hit the Sunda Straits seashore, caused by the eruption of Mount Anak Krakatau [18]. This catastrophe had a serious impact on Banten's western coast, which was severely damaged by the tsunami [18]. Natural catastrophes and unforeseen circumstances may affect travelers' choices of destinations for several reasons [5]. Learning from a deadly tsunami attack on the seashore will influence travelers' intention to visit seashore locations in the future. Regarding the intention to return to a risky tourism destination, it is important to understand that travelers develop a new perspective on a destination during the post-disaster phase [19]. Based on the reasoning and empirical data, we propose the following hypothesis:

Hypothesis 1: Perceived Risk (PR) will Influence Tourist Decision Planning (TD)

Safety concerns are a primary aspect of perceived risk that can significantly influence tourists' decision-making when considering visits to high-risk destinations [19]. Tourists' awareness of potential hazards—whether related to political instability, natural disasters, or health risks—shapes their perception of personal safety [20]. For many travelers, the perceived threat to personal safety can be a deciding factor in either avoiding or selecting a destination. When safety concerns are high, tourists tend to weigh the potential for harm against the perceived benefits of the visit, such as unique cultural experiences or scenic attractions. Thus, a high level of safety concern often reduces the likelihood of choosing a high-risk destination, while those with lower safety concerns may proceed, perceiving the rewards as outweighing the potential risks. This approach highlights the link between safety concerns and decision-making processes, showing how safety perceptions either drive tourists away from or draw them toward high-risk areas.

Hypothesis 2: Safety Concern (SC) will influence Tourist Decision Planning (TD)

In the context of tourism, perceived risk (PR) is a crucial bridge in the tourism environment that helps us understand how safety concerns (SC) affect travelers' decisions (TD). Travelers consider their personal safety concerns before evaluating the possible risks associated with a high-risk location. Their perception of danger is influenced by this preliminary safety assessment, which ultimately affects their choice to proceed with the trip or not. Safety concerns often stem from factors such as the threat of crime, natural disasters, or political instability in a destination. When tourists have heightened safety concerns, they tend to interpret the potential risks in more severe terms.

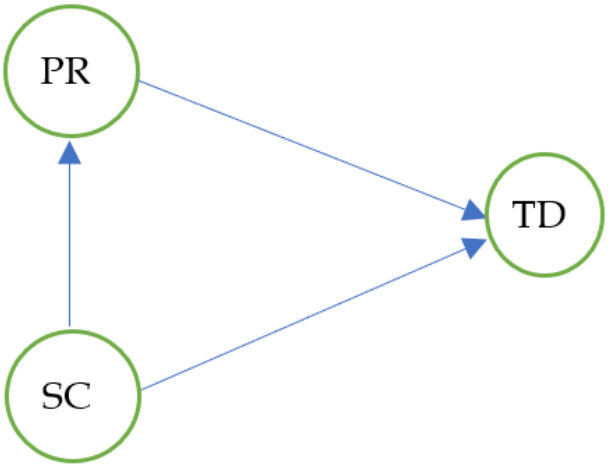

Figure 1. The conceptual model

This leads to a higher level of perceived risk, as tourists amplify their perception of possible harm based on the destination's safety conditions. Essentially, safety concerns fuel the perception of risk by intensifying travelers' focus on the potential for negative outcomes.

By converting travelers' broad safety worries into a concrete assessment of the risks unique to a destination, perceived risk may mediate the link between safety concerns and decision-making. Because of this mediation process, visitors' judgments may not be directly influenced by safety concerns alone. Rather, safety concerns may influence their perception of risk, which is the primary determinant of decision-making. Tourists are more inclined to steer clear of a site when perceived danger is increased by safety issues. On the other hand, tourists may move forward with their plans when perceived risk is reduced, even in the presence of certain safety concerns. As a result, perceived risk serves as a link between safety concerns and decision-making, clarifying and placing the impact of safety on the ultimate decision.

Hypothesis 3: Perceived Risk (PR) will mediate the relationship between Safety Concern (SC) and Tourist Decision Planning (TD)

Therefore, this research will attempt to answer three hypotheses regarding perceived risk, decision planning, and safety concerns. The proposed conceptual model is shown in Fig. 1.

2.5. Data collection

To investigate how tourists make decisions about visiting areas that have experienced tsunami attacks, this study collects data through an online questionnaire. A similar method has been applied to collect information on perceptions of tsunami hazards in the USA [21]. A total of 116 respondents who have spent vacations in tourism areas in the Sunda Straits were asked to participate in this study.

Table 1.
Demographic profile

No	Variable	Frequency	Percentage (%)
1	Gender		
	Male	69	60
	Female	47	40
2	Age		
	18-30 yr	112	97%
	31-45 yr	2	2%
	46-60 yr	2	2%
3	Revisit after Tsunami		
	Several times	47	41%
	once	32	28%
	no at all	37	32%
4	Area of origin		
	Inside Banten	110	95%
	Outside of Banten	6	5%

Table 2.
Indicator mesurement

No	Measuring instrument	Indicator	Outer Loading	Remark
1	Perceived Risk (PR)	PR 1	0.777	Passed
		PR 2	0.938	Passed
		PR 3	0.069	No Passed
2	Safety Concern (SC)	SC 1	0.713	Passed
		SC 2	0.208	No Passed
		SC 3	0.714	Passed
3	Tourist Decision (TD)	TD 1	0.995	Passed
		TD 2	-0.168	No Passed
		TD 3	-.0.061	No Passed

Table 3.
Construct validity and reliability

No	Variable	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted
1	PR	0.680	0.860	0.852	0.743
2	SC	0.125	0.125	0.696	0.533
3	TD	1.000	1.000	1.000	1.000

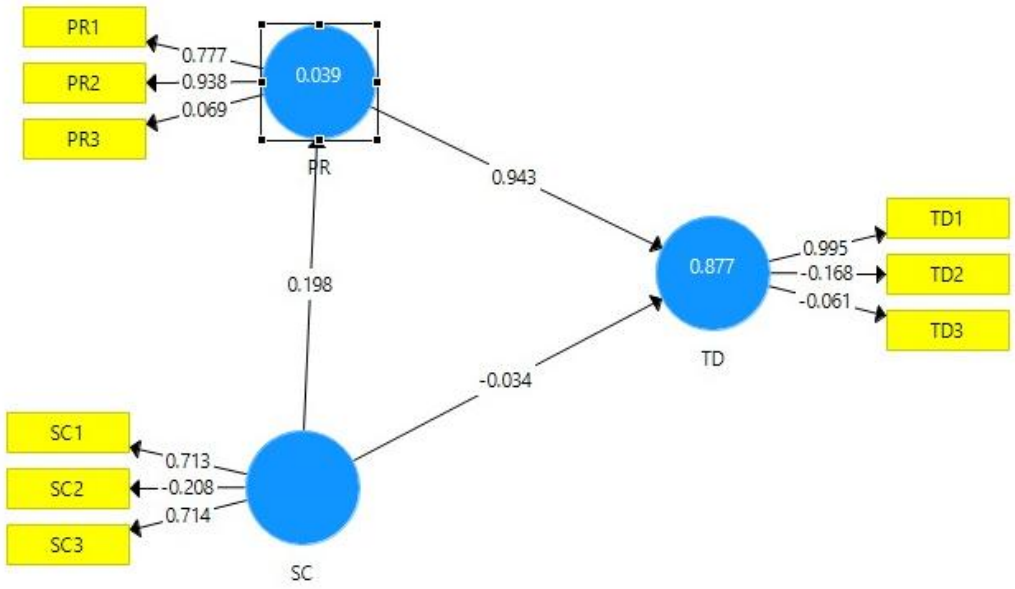

Figure 2. First Structural model relationship

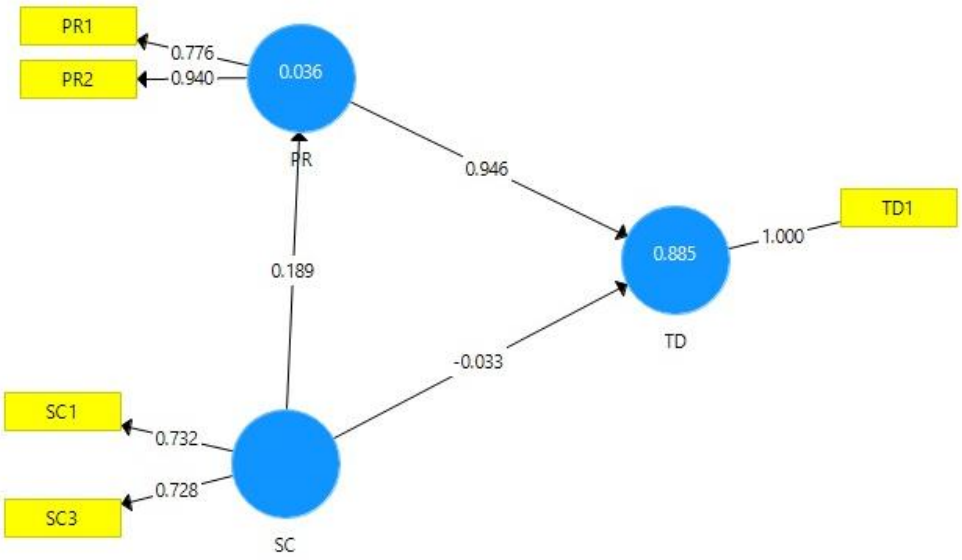

Figure 3. Final structural model relationship

Table 4.
Collinearity statistic

No	Variable	Value
1	PR1	1.367
2	PR2	1.369
3	PR3	1.007
4	SC1	1.002
5	SC2	1.006
6	SC3	1.003
7	TD1	1.005
8	TD2	1.049
9	TD3	1.044

Table 5.
Significance of structure relationship

No	Hypothesis	Path coefficient
1	H1: PR -> TD	0.946
2	H2: SC -> TD	-0.033
3	H3: SC -> PR	0.189

3. Results and discussions

3.1. Measurement model assessment

The measurement model is evaluated according to three criteria: the first requires that each construct's Cronbach's alpha be greater than 0.6 and the composite reliability be greater than 0.7, indicating good internal consistency; the second is based on the evaluation results and shows that all indicator outer loading values satisfy the requirements, with none lower than 0.4. This result emphasizes the validity, reliability, and consistency of the measurement model; the third requires that each construct's value be greater than 0.5, confirming the fulfillment of these requirements [22].

The construct validity and reliability test were conducted using SmartPLS 3.0. A loading factor value is considered valid/reliable if it has a correlation value greater than 0.7; however, for research in the early phases of building a measurement scale, a loading value between 0.5 and 0.6 is considered acceptable. If the final value is less than 0.5, the indicator is deemed invalid and must be deleted from the model, requiring the data processing (running the data) to be repeated. Therefore, the indicator for convergent validity can be accepted if all item loadings are greater than 0.5. In this study, the Cronbach's alpha was below 0.5 for one construct (SC; Safety Concern).

3.2. Structural equation

To ensure the validity and reliability of the data, the measurement model must be thoroughly examined as part of the structural model assessment process. This includes identifying multicollinearity, a factor that can affect estimation accuracy and significance. Multicollinearity is identified by calculating the Variance Inflation Factor (VIF), which measures how much the variance of the regression estimator's coefficient increases when correlated with other independent variables. If the VIF exceeds 5.00, collinearity is considered present. Table 4 presents the results of the multicollinearity examination within the measurement models, confirming the absence of such issues.

Based on Table 5, the significance of the structural model relationships is assessed using the values of the path coefficients. The path coefficient between latent variables indicates the strength of their relationship. The significance of the relationship between Perceived Risk and Tourist Decision is shown by a path coefficient of 0.946, which is very strong.

On the other hand, the relationship between Safety Concern and Tourist Decision is represented by a path coefficient of -0.033, indicating an inverse relationship. A negative path coefficient reflects an inverse relationship between the constructs, meaning that as

Safety Concern increases, Tourist Decision tends to decrease, and vice versa. The strength of this negative relationship is determined by the magnitude of the coefficient. A more negative value signifies a stronger inverse relationship, while a value closer to zero suggests a weaker relationship. When examining the relationship between Safety Concern and Perceived Risk, the path coefficient is 0.189, indicating a very weak relationship.

4. Conclusions

This study reveals that tourist decisions regarding visits to tourism areas with a high risk of tsunami attacks are significantly influenced by perceived risk and safety concerns. The most influential factors affecting tourists' decisions are their perceptions of risk and safety. The study focuses on how international visitors' concerns about their safety are shaped by the perceived risk of a tsunami, which varies depending on their level of participation. Additionally, the study highlights the importance of addressing safety concerns through effective risk communication and preparedness measures to enhance tourists' confidence in visiting high-risk areas.

Declaration statement

Yusraini Muharni: **Conceptualization, Methodology, Writing-Original Draft**. Elis Ratna Wulan, Maria Ulfah: **Methodology, Data Analyzing**. Hartono, Ade Irman Saeful Muttaqien: **Collecting data**. Anting Wulandari: **Writing-Review & Editing**.

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Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article or its supplementary materials.

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