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CONCEPTUALIZATION OF TURNER'S VULNERABILITY – MOUNTAINOUS GEOGRAPHICAL TOURISM SENSITIVITY TO NATURAL DISASTER

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Abstract

While interest in studying the impact of natural disasters on tourism is growing, a noticeable gap exists in exploring destination-level tourism sensitivity, particularly in geographical contexts. This study addresses this gap by using the 2015 Ranau earthquake as a case study to assess the sensitivity of mountainous geographical tourism to natural disasters, employing the Turner Vulnerability Framework. In-depth interviews with Ranau's tourism entrepreneurs and operators, selected through purposive sampling, provide insights, and thematic analysis is conducted to understand qualitative responses comprehensively. The findings reveal that mountain tourism in Ranau showed significant sensitivity to the 2015 earthquake, primarily attributed to the Source element, including tourism products, business size, development, and perceived disaster impact. In contrast, the Power elements exhibited relatively lower sensitivity. These findings underscore the importance of tailoring geographical-based adaptations within tourism systems in response to natural disasters and emphasize integrating natural disaster management into tourism development for long-term sustainability.

Keywords: Tourism Sensitivity, Mountain-Geographical, Natural Disasters, Turner Sustainability Analysis

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INTRODUCTION

Tourism, a rapidly expanding industry of significant economic importance, plays a crucial role in currency exchange activities, as the World Tourism Organization (WTO) noted in 2013. It significantly contributes to social and economic development, particularly in communities reliant on tourism for livelihoods (Guo et al., 2018). However, tourism is highly vulnerable to natural disasters (Alvarez et al., 2022). Dahles and Susilowati (2015) argue that natural disasters pose substantial challenges for local tourism in developing countries, as core attractions are often provided by small and medium-sized businesses (Estevao & Costa, 2020). Consequently, natural disaster management is integral to sustainable tourism development (Orchiston, 2012). Tourism involves proactive measures to mitigate destruction and facilitate restoration (Faulkner, 2001). Despite this integration, there is limited discussion on the susceptibility of tourism destinations in mountainous areas to natural disasters. Each geographical area may exhibit unique sensitivities (Gong & Hassink, 2020). Understanding these sensitivities is essential for effective risk management, minimizing impacts, and promoting resilience and sustainability (Li & Wang, 2021). This paper aims to assess the sensitivity of mountainous tourism destinations to natural disasters. The recurring nature of these shocks highlights the need to address chronic sources of vulnerability, which make destinations susceptible to ongoing external shocks (Alvarez et al., 2022).

LITERATURE REVIEW

Vulnerability to Natural Disasters

Various sources comprehensively define vulnerability to natural disasters. The United Nations Office for Disaster Risk Reduction (2019) attributes vulnerability to societal and economic conditions impacting preparedness and responses. Sharma and Ravindranath (2019) describe it as a system's susceptibility to adverse effects from external shocks, tied to the characteristics of a social-ecological system or community determining their risk management abilities. Kaspersen et al. (2012) view vulnerability as the susceptibility of an exposed unit to hazards due to exposure to shocks, encompassing the capacity to respond, recover, or adapt. Birkmann et al. (2022) defines it as systemic societal vulnerability, focusing on society or its sub-systems (e.g., demographic groups or infrastructures), independent of specific climate-related hazards. The term "systemic" highlights inherent obstacles in dealing with and adapting to climate change and natural hazards. These definitions highlight that vulnerability is specific to certain system groups, involving internal and external factors. This perspective facilitates the exploration of location-specific factors and individual

circumstances contributing to varying levels of vulnerability and resilience (Rigg et al., 2008).

Tourism Sensitivity Analysis

Sensitivity, a crucial aspect of vulnerability, mediates risk exposure and resilience (Adger, 2006). Clark et al. (2000) define sensitivity as the extent to which a group or individual is affected by stressors, considering it a system-level attribute influenced by external factors. Community hazard perception is shaped by risk dissemination through social channels such as individuals, groups, media, and institutions (Kasperson et al., 2012). Understanding actors' narratives is essential for comprehending tourism vulnerability, particularly concerning natural disasters. Matusin et al. (2019) developed the Vulnerability Framework for Sustainable Tourism Development (VFSTD) to assess vulnerability in tourism destinations. VFSTD integrates two key components: Power, representing social capacity (Howitt, 2001), and Source, reflecting coping and adaptation abilities (Birkmann et al., 2022). The creation of tourism products is significantly influenced by destination image (Dredge & Jenkins, 2003). VFSTD highlights critical Source indicators such as Business Size, Tourism Products, Duration of Operation, and Tourism Disaster Management (Matusin et al., 2019). Natural disasters significantly impact tourists' perceptions of safety (Ritchie, 2008). Adjustments to reduce vulnerability are crucial for sustainable tourism (Baker & Coulter, 2007), underscoring the pivotal role of effective natural disaster management.

In VFSTD, the Power element focuses on social capital, encompassing bonding, bridging, and linking social capital. As defined by Coleman (1988), social capital refers to the benefits derived from relationships within social networks, which are invaluable during crises (Portes, 2000). In tourism, social capital aids destinations in navigating catastrophic situations (Hwang & Stewart, 2017), providing a theoretical basis for adaptation mechanisms and resilience (Guo et al., 2018). Social capital is fundamental for sustainable tourism development, facilitating collaboration and enhancing governance efficiency (Nunkoo, 2017). Post-disaster recovery relies on bonding (close internal relationships), bridging (external relationships among diverse individuals), and linking (trust-based vertical networks) social capital (Matusin et al., 2019). Matusin et al. (2020) highlighted substantial tourism exposure to natural disasters, amounting to 51% during the 2015 Ranau earthquake. However, the Sensitivity component of VFSTD requires empirical testing. This study aims to assess tourism sensitivity to natural disasters in mountainous areas using the Sensitivity component of VFSTD. Figure 1 illustrates VFSTD's Sensitivity adaptation, encompassing two critical vulnerability drivers.

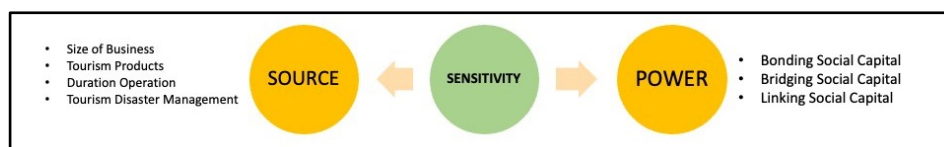


Figure 1: Sensitivity Component of VFSTD

Source: Matusin et al. (2019)

RESEARCH METHODOLOGY

Case Study – Mount Kinabalu Earthquake

The June 2015 Ranau earthquake, registering a magnitude of 6.0 and intensity level VII, is Malaysia's most powerful seismic event to date. The epicenter was located 7 km North-next of Kundasang Town and 13 km northwest of Ranau Town, at a depth of 10 km (US Geological Survey, 2015; Tongkul, 2015). This earthquake severely damaged infrastructure and the environment, impacting schools, mosques, churches, hostels, rivers, hiking trails, flora, and fauna (Tongkul et al., 2017). Tragically, climbers lost their lives, with many others stranded on Mount Kinabalu (Matusin et al., 2019).

Research Approach and Design

This study adopts a constructivist approach, emphasizing interactions within both the physical world and the human environment (Blaikie, 2010). Constructivists leverage personal experiences to explore phenomena (Creswell, 2014) comprehensively. Employing a qualitative case study methodology, this research aimed to glean insights from tourism entrepreneurs and operators in mountainous regions regarding the impact of the 2015 Ranau earthquake. This approach, commonly employed in tourism vulnerability studies, addresses the earthquake's effects on economic resilience (Cradock-Henry et al., 2018), recovery (Sanders et al., 2015), and vulnerability (Calgaro et al., 2014), providing nuanced understanding and in-depth data (Maxwell, 2005).

Data Collection and Analysis

The Ranau-Kundasang area was selected due to the significant impact of the 2015 Ranau earthquake, as documented by the US Geological Survey (2015) and Felix Tongkul (2015). Tourism entrepreneurs and operators in Ranau were chosen through purposive sampling based on specific criteria (Chua, 2014). Informants actively involved in tourism before the 2015 earthquake were selected. Face-to-face semi-structured interviews were conducted to gather detailed information, lasting 1.5 to 2 hours (Campiranon & Scott, 2014). Data collection took place from early September to late October 2018, involving 30 informants until a saturation point was achieved (Guest et al., 2006). Of the informants, 80% represented small and medium-sized enterprises (SMEs), while 20% came from

large-scale tourism companies. Verbatim transcripts were subjected to thematic analysis following Braun and Clarke's (2006) approach, focusing on vulnerability drivers within the Sensitivity component. Creswell (2014) recommends the inclusion of direct quotes and detailed descriptions to enhance validity. The six-phase thematic analysis framework proposed by Braun and Clarke (2006) was employed, with qualitative data quantified through percentage calculations for final scoring.

ANALYSIS AND DISCUSSION

This study emphasizes the Power and Source elements, with Figure 2 illustrating the thematic sensitivity analysis of Ranau's tourism sector concerning the 2015 earthquake. The diagram delineates three to four themes for each controlled variable. The source comprises nine subthemes: Tourism Product (Response, Attraction, Booking, Income), Size of Business (Staff, Facility), Duration of Operation (Development), and Disaster Perception (Trauma, Chaos). Power encompasses five themes: Bonding (Relationship, Cooperation), Bridging (Participation), and Linking (Collaboration, Research).

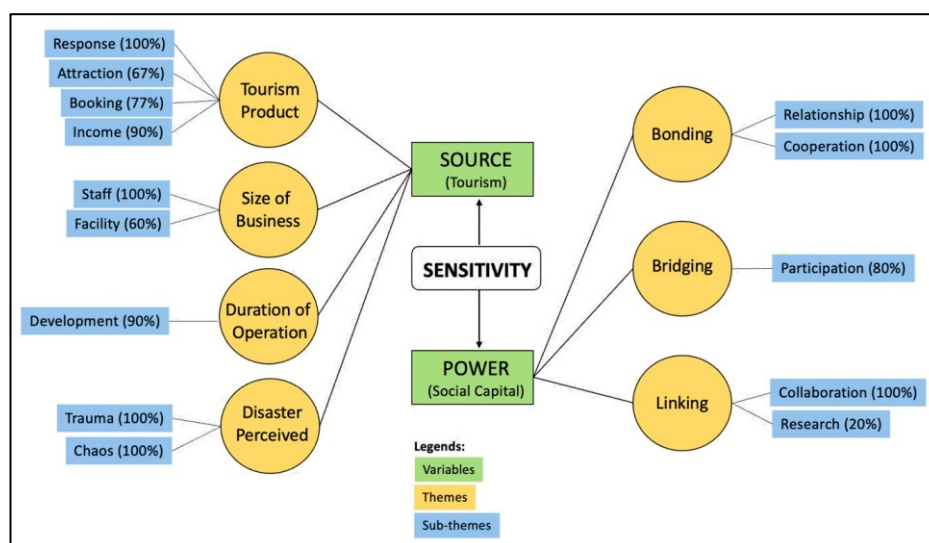


Figure 2: Themes of Tourism Sensitivity in Ranau to the 2015 Earthquake

Source – Tourism Product

In the "Tourism Product" category, four subthemes—Response, Attraction, Booking, and Income—underscore the sensitivity of Ranau's tourism sector. The Response subtheme highlighted significant declines in tourist arrivals due to apprehensions and damaged attractions. Interviewees expressed concerns about

visiting Ranau, particularly Mount Kinabalu, the earthquake's epicenter, resulting in a sharp decrease in tourist numbers within three to six months post-earthquake. Negative media portrayals exacerbated this decline. An informant stated, "After the earthquake, we lost our tourists. almost no tourist came within these six months" (Informant 18). Kinabalu Park reported a substantial shortfall of 103,359 visitors in 2015 (Table 1). The Attraction subtheme detailed the devastation of natural attractions, such as river streams and dislodged mountain rocks, leading to secondary consequences like mud floods. One informant described, "All the rocks have fallen, crashing through the vegetation" (Informant 13). Figure 3 illustrates the damage along Mount Kinabalu's climbing trail. The Booking subtheme focused on sudden cancellations of accommodations and travel packages post-earthquake. All providers reported a surge in cancellations, with some customers rescheduling. One informant noted, "After the earthquake struck, all the customers cancelled their bookings" (Informant 27). The Income subtheme revealed the earthquake's impact on informants' earnings, with many experiencing high booking cancellations and a lack of visitors. Some had to refund payments, significantly affecting their income. An informant summarized, "Our income has plummeted, and no activities are taking place at all" (Informant 14).

Table 1: Number of Visitors to Kinabalu Park (2012 to 2015)

Year	2012	2013	2014	2015
Number of visitors	285466	332838	314139	210780

Source: Sabah Park (2018)



Figure 3: Damage of Nature Trail of Mount Kinabalu due to earthquake 2015

Source: Utusan (2015)

Source – Size of Business

Within the "Business Size" theme, two subthemes emerged: Staff and Facility. This theme highlights the sensitivity of Ranau's tourism sector to the impact of the earthquake on their operations. The "Staff" subtheme reveals that operators maintained their staff continuity after the 2015 earthquake. Overall, informants confirmed that there were no reductions in staffing or labor force capacity. One informant stated, "All our staff members are still with us. They have continued their work as usual even after the earthquake, requiring some additional tasks to repair the damage" (Informant 12). The "Facility" subtheme details the sector's sensitivity to facilities in Ranau post-earthquake. Most informants reported damages, including cracks in walls and floors, water pipe leakages (especially in toilets), and a significant water shortage. An informant explained, "We lost our clean water supply after the earthquake. Our water catchment was severely affected due to mud floods. Water pipes are leaking, and the walls and floors have developed cracks" (Informant 28).

Source – Duration of Operation

Within the theme of "Source," there is a subtheme known as "Duration of Operation," which primarily focuses on "Development." This theme elucidates the sensitivity of Ranau's tourism development in response to the 2015 earthquake. Most informants described how their development activities during that year (2015) had to be temporarily halted. As discussed previously, the development activities in Ranau's tourism sector were significantly impacted by the variables related to tourism products and the size of businesses. Consequently, the development activities faced numerous challenges. One informant recounted, "We were building additional rooms for our accommodation, and everything was progressing smoothly until the earthquake struck. We had to halt the construction due to various challenges" (Informant 13).

Source – Disaster Perceived

The "Disaster Perceived" theme under "Source" includes "Trauma" and "Chaos," examining the tourism community's response to the Ranau earthquake. "Trauma" captures their initial experience with such a disaster, the strongest in Malaysia since 1972. One informant recalled, "We were all screaming out of fear. Our houses were shaking vigorously" (Informant 20). "Chaos" describes the confusion and lack of preparedness, with another informant stating, "We fled from our office, rushed out of our building. We were terrified" (Informant 13). Ranau tourism's sensitivity to the 2015 earthquake is categorized into affected aspects (e.g., decline in tourist arrivals, damage, booking cancellations) and unaffected characteristics (e.g., staff capacity). Sensitivity levels are high for

"Tourism Product," "Duration of Operation," and "Disaster Perceived," with "Size of Business" showing moderate sensitivity. Ranau tourism's Source sensitivity is 92%, indicating substantial sensitivity.

Table 2: Score of Ranau Tourism Sensitivity - *Source*

Controlled Variables (CV)	Subthemes	Characteristics	Sensitivity Level of CV
Tourism Products	<i>Response</i>	Affected	High
	<i>Attraction</i>	Affected	
	<i>Booking</i>	Affected	
	<i>Income</i>	Affected	
Size of Business	<i>Staff</i>	Unaffected	Moderate
	<i>Facility</i>	Affected	
Duration of Operation	<i>Development</i>	Affected	High
Disaster Perceived	<i>Trauma</i>	Affected	High
	<i>Chaos</i>	Affected	
Calculation Score			
Level	Score	Overall Score	12
Low	1	Source Score	3+2+3+3=10
Moderate	2	Sensitivity Percentage	92%
High	3	(Source)	

Power – Bonding, Bridging, Linking

The analysis explores Ranau tourism's sensitivity to the 2015 earthquake within the context of Power (social capital). The "Bonding" variable encompasses "Relationship" and "Cooperation." "Relationship" underscores the resilience of internal bonds, with informants noting uninterrupted relationships post-earthquake. One stated, "The earthquake did not disrupt our relationships" (Informant 4). "Cooperation" highlights strong team support during and after the earthquake, with an informant noting, "All our staff stayed together during the disaster" (Informant 17).

The "Bridging" variable reveals "Participation," assessing community involvement in tourism. Most informants reported unaffected or increased participation post-earthquake, with one explaining, "We have had more meetings and activities after the earthquake" (Informant 8). The final Power variable, "Linking," signifies the sensitivity of Ranau Tourism's networking and relationships with stakeholders post-earthquake. This variable includes two subthemes: "Collaboration" and "Research." "Collaboration" indicates strengthened cooperation among Ranau tourism stakeholders after the disaster, particularly with government agencies. An informant noted, "We were visited by

the Ministry of Tourism every week to monitor the situation here after the earthquake" (Informant 24). However, collaborations with some tourism agencies were disrupted, leading to booking cancellations and alternative packages. An informant explained, "After the earthquake, tourism agencies cancelled trips to Ranau, opting for other destinations due to apprehensions" (Informant 20). The "Research" subtheme highlights that research activities were postponed due to site closures post-earthquake. An informant clarified, "Any study or research had to be temporarily halted due to safety considerations" (Informant 3).

Overall, Ranau tourism's Power sensitivity to the 2015 earthquake includes both affected and unaffected subthemes. Research activities were impaired, while "Relationships," "Cooperation," "Participation," and "Collaboration" remained unaffected. Table 3 illustrates Power's sensitivity at 44%. "Bonding" and "Bridging" show low sensitivity, while "Linking" demonstrates moderate sensitivity. Combining Source and Power, Ranau tourism's overall sensitivity is 68% (Table 4), indicating significant sensitivity to the 2015 earthquake.

Table 3. Score of Ranau Tourism Sensitivity - *Power*

Controlled Variables (CV)	Subthemes	Characteristics	Sensitivity Level of CV
Bonding	<i>Relationship</i>	Unaffected	Low
	<i>Cooperation</i>	Unaffected	
Bridging	<i>Participation</i>	Unaffected	Low
Linking	<i>Collaboration</i>	Unaffected	Moderate
	<i>Research</i>	Affected	
Calculation Score			
Level	Score	Overall Score	9
Low	1	<i>Power</i> Score	1+1+2 =4
Moderate	2	Sensitivity Percentage	44%
High	3	(<i>Power</i>)	

Table 4. Collective Score of Ranau Tourism Sensitivity

Component	Sensitivity	Overall Percentages
<i>Source</i>	92%	68%
<i>Power</i>	44%	

DISCUSSION

The primary focus in assessing Ranau's tourism sensitivity lies in stakeholders' post-earthquake income decline, reflecting the indirect consequences of Ranau's tarnished image, particularly its natural attractions like Mount Kinabalu. The significant decrease in tourist arrivals was exacerbated by numerous booking

cancellations due to the negative perception of Ranau after the disaster, instilling fear among potential visitors. Chacko and Marcell (2008) highlight how shocks or pressures in an area can heighten the vulnerability of tourist destinations. The degradation of the destination's image, linked to both the disaster and negative publicity, can deter tourists due to safety concerns or negative feedback (Scott et al., 2008). This temporarily ceased tourism operations, severely impacting Ranau's tourism sector.

The study primarily explores the damage to Ranau's tourism infrastructure caused by the 6.0 magnitude earthquake, which underscores the inherent vulnerability of Ranau's mountainous terrain. Unlike lowland regions, tourism often develops in these sensitive areas due to their unique geographical allure and natural beauty. Jodha (1991) emphasizes the inaccessibility, topographical challenges, and ecological diversity of mountainous areas, which attract nature tourism but also pose significant challenges (Nyaupane & Chhetri, 2009). Petrosillo et al. (2006) explain that sensitivity depends on how environmental resources interact with changes caused by natural forces or human activities. Thus, the damage to Ranau's tourism facilities post-earthquake results from various internal and external factors.

Tourism product offerings and business scales hindered Ranau's post-disaster tourism sector development initiatives. Recovery efforts, including multitasking and managing financial constraints, took precedence over scheduled activities. About 80% of informants represented small-scale private tourism operators with limited capacity, contrasting with the 20% associated with larger operators equipped with contingency plans or recovery resources. Recovery was particularly challenging as none of the informants had specific natural disaster management protocols, resulting in traumatic experiences. This challenge arises from the lack of alignment between natural disaster management, disaster risk reduction, and broader national and local sustainable tourism development agendas, leading to a chaotic situation in Ranau's tourism sector.

Following the earthquake, Ranau's tourism sector exhibited low sensitivity across all social capital themes (Bonding, Bridging, Linking), consistent with Matusin et al. (2020). The relationship between exposure and sensitivity is crucial in determining system vulnerability. Clark et al. (2000) note that sensitivity measures the impact on a group based on exposure to stressors influenced by the strengths and weaknesses of the social system (Calgaro et al., 2014). Community participation is fundamental in enhancing tourism advantages and mitigating negative impacts (Azwar et al., 2023). This study underscores the importance of sensitivity in bolstering Ranau's tourism sector resilience, as it reveals vulnerabilities and triggers strategies to manage challenges. Therefore, standardizing and implementing a more sustainable disaster risk management system is imperative in all disaster-prone areas (Said et al., 2024).

The sensitivity of Ranau's mountainous system is influenced by two primary components: Source (environmental element) and Power (social capital). Source significantly impacts sensitivity, encompassing products, facilities, management, and human resources. Ranau's ecotourism heavily relies on its natural environment, shaping its destination image. Conversely, Power is crucial in regulating sensitivity, mainly when influenced by Source. This study illustrates how low social capital sensitivity can affect Ranau's tourism sensitivity, supporting Turner's Vulnerability Framework, which emphasizes the interplay between Environment and Human elements. Understanding this interplay is essential for analyzing system sensitivity.

CONCLUSION

Sensitivity in this context refers to a system's ability to detect and respond to external shocks or stressors, influenced by both human and environmental factors. This study highlights the significant sensitivity of mountainous geographical tourism destinations to earthquakes, particularly concerning tourism products, business size, duration of operation, and perceptions of disaster. Interestingly, the findings suggest that small and medium-sized tourism businesses may be more vulnerable to external uncertainties than to internal social factors. By applying Turner's vulnerability framework to the tourism context, this research contributes to a deeper understanding of vulnerability analysis across various fields and geographical areas. It underscores the importance of integrating natural disaster management within tourism destinations. Future research could expand this analysis by exploring additional sensitivity factors, such as macro-political economy, institutional dynamics, and global trends. This approach would provide a more comprehensive understanding of tourism sensitivity across different temporal and geographical contexts.

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