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Risk awareness and intended tsunami evacuation behaviour of international tourists in Kamakura City, Japan

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A B S T R A C T

The present study focuses on analysing the state of the tsunami risk communication strategies, awareness and intended evacuation behaviour amongst tourists in Kamakura City, Japan. A mixed methodologies approach was utilized, using key informant interviews, site surveys and questionnaire surveys to understand the risk awareness of this transient group of the population. The results of the survey showed a relatively high risk awareness and willingness to evacuate, though there was some confusion regarding the direction of evacuation, mode of transportation, and location of evacuation areas in the city. A majority of respondents stated that they would expect to be warned of a threat by an official warning or announcement, whereas a minority mentioned social cues as a way to understand what to do, possibly thus requiring changes to the city's risk management strategies. In Japan, the concept of *tendenko* has been getting more attention since the 2011 Tohoku Earthquake and Tsunami, which calls for each individual to immediately initiate evacuation by himself or herself, requiring the trust that other members of the family and community will be doing the same. Based on these findings the authors outlined a number of recommendations to improve disaster risk management for the case of tourists visiting Kamakura city.

1. Introduction

There is a growing body of literature on evacuation research, though comparatively little of that research has been carried out on tsunami evacuation behaviour. Moreover, studies focusing on evacuation behaviour have mostly addressed local residents, creating a gap in research regarding transient population in touristic at-risk locations.

The general objective of the present study is to address this gap in knowledge regarding tsunami evacuation behaviour, by considering the subgroup of international tourists as a vulnerable and relevant population to be targeted in emergency planning initiatives. Specific objectives involve assessing the current state of risk communication strategies at a tourist destination, with the goal of identifying the different strategies available to local authorities, and evaluate their limitation when attempting to reach the international tourist audience. Additionally, the present work aims to study the level of tsunami risk awareness and intended evacuation behaviour of international tourists, by presenting an hypothetical scenario followed by alternatives on their evacuation decision-making process.

The following subsections will outline relevant literature on the subject, including that on evacuation behaviour, risk perception and communication, and evacuation behaviour of tourists, attempting to link it to the objectives of the paper that were just described.

1.1. Evacuation behaviour

There has been a growing recognition on the importance of soft measures during tsunami events, as hard measures are no longer considered enough to protect lives [47,58]. The United Nations International Strategy for Disaster Reduction (UNISDR) has defined non-structural measures (or *"soft measures"*) as "any measure not involving physical construction that uses knowledge, practice or agreement to reduce risk and impacts, in particular through policies and laws, public awareness raising, training, and education" [53].

Gwynne et al. [15] noted how by 1999 there was already a tendency to include greater behavioural detail into evacuation simulations [51]. Simulations with agent-based models have been applied to research the evacuation of buildings [22,46,49], improve emergency planning for flooding events [34], hurricane evacuation [17,39,54] and for the analysis of large-scale pedestrian flows during evacuation in a tsunami

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event [52,56].

Some of the most relevant and known studies concerning evacuation behaviour during natural disasters were focused on hurricane evacuation. Whitehead et al. [55] conducted a research to identify determinants of evacuation behaviour in households in North Carolina, considering their real evacuation behaviour during Hurricane Bonnie and future intended behaviour. Their research suggested that the strongest predictor of evacuation behaviour was storm intensity. Another study by Kang et al. [28] found that there was some correlation between the expected (two years before the event) and actual evacuation behaviour of residents during Hurricane Lili. This suggests that emergency planners can use many aspects of evacuation expectations with results "demonstrating a significant degree of correspondence between behavioural expectations and much later behaviour under quite stressful conditions" [28]. Solis et al. [50] found that people living in riskier areas of Florida were more willing to evacuate. Other studies like Lindell and Hwang [32] have researched evacuation behaviour from a multi-hazard perspective that included hurricane events, adding to the evidence that some demographic variables can have an effect on the actions undertaken by people. Fraser et al. [11] conducted a questionnaire survey on hazard awareness and tsunami evacuation behaviour of local residents and national and foreign visitors to Napier City, New Zealand. Some of the results of the study indicated a relatively high level of knowledge among residents, and a high level of awareness among residents and visitors (although it was also found that the tourism industry did not generally provide much information to tourists).

However, New Zealand was arguably not as well prepared against tsunamis as the Tohoku region, though the unprecedented magnitude of the disaster overcame tsunami defence structures throughout the region. This situation led to a debate regarding the philosophy and strategies on how to protect against tsunamis [18,47], which in turn resulted in a number of studies on the subject. Yun and Hamada [58] studied the effects of place safety, disaster preparedness, and evacuation time on the survival rates for this event, analysing the differences in behaviour between survivors and non-survivors. Their results reported that starting evacuation during the first 30 min had a significant impact on the survival rate, but the relative safety of evacuation areas and better preparedness before the disaster had no positive effect on people's survival. Their recommendations highlight the need to improve warning systems and strengthen evacuation education, instead of a relying purely on "hard measures" [58].

Gregg et al. [14] researched the recognition and socio-cognitive factors of tsunamis natural warnings based on the experience of the 2004 Great Sumatra Earthquake and Tsunami in Thailand. Kanai and Katada [27] identified issues among Japanese residents' evacuation behaviour during the tsunami resulting from the 2010 Chilean Earthquake. Esteban et al. [8] made a comparative study regarding recent tsunami events and preparedness between Indonesia, Chile and Japan. Other studies after the 2011 Tohoku Earthquake and Tsunami have looked at the evacuation process and human loss distribution [38]; strategies for tsunami evacuation focused on transportation [31]; and evacuation behaviour analysis from tsunami and fire [2]. Finally, some studies have focused on analysing and proposing new directions for disaster preparedness for tsunami mitigation and evacuation, focusing on case studies of vulnerable areas around the Sagami Bay [18,47].

1.2. Risk perception and risk communication

Riad et al. [41] argued that evacuation behaviour is related to the characteristics of each individual, in combination with psychological processes. Namely, three processes can be identified: risk perception, social influence, and access to resources. Risk perception and behaviour have been studied by a wide array of disciplines, and for instance Burns and Slovic [3] mention psychology, sociology, communications, system dynamics, statistical modelling, policy analysis, law, economics, network analysis, engineering, decision analysis, and emergency management practitioners.

The Protective Action Decision Model (PADM) seeks to explain people's behavioural response to natural hazards and disasters [33]. This model considers three pre-decision processes, including exposure to the hazard, attention, and comprehension of environmental/social cues. Furthermore, the authors identify three core perceptions (threat perception, protective action perception, and stakeholder perception) that inform the protective action decisions of an individual, and ultimately their behavioural response. Lindell and Perry [33] suggest that PADM could be applied to evacuation models, highlighting the importance not only of whether someone will evacuate, but also on the time taken to decide to evacuate and the time spent on logistical preparations for this evacuation.

As explained by the PADM, one of the characteristics of a behavioural response to a natural threat is seeking information. To explain the role of risk communication Sheppard et al. [45] utilize "the definition offered by Covello [5], who wrote of the "process of exchanging information among interested parties about the nature, magnitude, significance, or control of a risk". In their review of risk communication theories, Sheppard et al. [45] explain that an effective risk communication strategy has to be adapted to the type of risk being addressed, based on the level of dread that the risk is associated with and how familiar the risk is to the public. Failure to correctly understand a hazard can have severe consequences, and lack of familiarity with storm surges was a big factor behind the large death toll in the 2013 storm surge that resulted from typhoon Haiyan in the Philippines [30,9].

Finally, a study conducted by O'Neill [40] states that the main factors that contribute to the effectiveness of a community safety program are: (1) the nature of the hazard and the risk associated, (2) risk perception and people's willingness to act, (3) identification of the stages of risk communication, (4) Identification of audiences and their associated messages, and (5) community resilience.

1.3. Evacuation behaviour of tourists

Traditionally some subgroups of the population have been recognized as more vulnerable than others to natural disasters. Gray-Graves et al. [13] addressed the vulnerability of senior citizens during a disaster by studying their willingness to evacuate, showing marginally greater willingness to comply with mandatory evacuation.

The importance of tourists as a vulnerable group and the difficulties they face during evacuation have also been recognized [35,6,55]. Matyas et al. [36] point out the importance of considering the tourist population in their study site in Florida, as it attracts a great number of visitors that may lack knowledge about hurricane risks, be unfamiliar with their surroundings, and do not count with the support network of their local community or home. Additionally, Matyas et al. [36] mention a literature gap on tourists' perceptions and hurricane evacuation preferences. Other disaster management studies focused on tourists include Sharpley [43], who argues about the impact that the Indian Ocean Tsunami had in the global public because of the large number of tourists that were victims of the tsunami; and Faulkner [10] and Rittichainuwat [42], who discussed that despite tourists destinations being at risk little research had been conducted on their disaster management. Drabek [6, 7] emphasizes the need to establish community partnerships between local emergency managers and tourist industry representatives, and for more training activities to be conducted with those working in the tourist industry. However, Johnston et al. [23] showed that training and preparedness for tsunami and other hazards in coastal Washington (USA, an area which has significant tsunami risks) was generally very low (particularly amongst the smaller operators).