TOURISM SECTOR PREPAREDNESS IN ZONES WITH A HIGH SEISMIC RISK: A CASE STUDY OF THE CAPITAL REGION OF JAPAN

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ABSTRACT

Japan is a country highly vulnerable to natural disasters, especially earthquakes. Tourism, as a strategic industry in Japan, is especially vulnerable to destructive earthquake disasters owing to the characteristics of vulnerability, sensitivity and substitutability (or replaceability). Here we aim to provide theoretical understanding of the perception and responses of tourism managers towards damaging disasters in tourism destinations with high seismic risks. We conducted surveys among the mangers of tourism businesses in the capital area of Japan and applied structural equation modeling techniques to empirically test the proposed model with four latent variables, which are risk perception, threat knowledge, disaster preparedness and earthquake preparedness. Our results show that threat knowledge affects risk perception and disaster preparedness positively. In addition, disaster preparedness positively affects earthquake preparedness. However, the proposed paths from risk perception to disaster preparedness, risk perception to earthquake preparedness, and threat knowledge to earthquake preparedness were not statistically significant. Our results may provide references for policymakers in promoting crisis planning in tourism destination with high seismic risks.

Keywords: disaster preparedness, resilience, risk perception, seismic risk.

1 INTRODUCTION

The Japanese government has positioned tourism as a strategic country to revitalize Japan's economy, and has been making efforts to promote Japan as a 'tourism-based Country'. Given Tokyo as Japan's capital and also a popular tourism destination, according to the Japan Tourism Agency (JTA), the National Capital Region takes a large share of accommodation guests (20.4% in 2012; 20.2% in 2013) [1]. However, experts estimated that large-scale earthquakes with a magnitude of 7.3 may occur near the capital region with a high probability of 70%, i.e. Tokyo Inland Earthquake.

Tourism industry is vulnerable to a series of disaster occurrences as it is a comprehensive industry and depends on so many components and individual businesses, and more importantly, disasters may endanger the safety of visitors [2]. Safety and security are the essential conditions for the tourism development and thus are the fundamental determinants for its growth. When tourism ceases to be pleasurable due to actual or perceived risks, tourists exercise their freedom and power to avoid risky situations or destinations [3]. There is wide agreement among authors regarding the influences of disasters on tourism [4–7]. Wu and Hayashi [6] examined that the 2011 Great East Japan Earthquake seriously struck inbound tourism in Japan and the recovery process after the disaster was long and complex. Therefore, confronted with the estimated coming earthquakes, it is vital to grasp current preparedness level and when necessary to improve resilience in seismic risk areas. First of all, it is essential to investigate preparedness level, such as whether and to what extent the tourism sectors in the region have adopted measures to deal with the estimated earthquakes. On the basis of this

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background, this study conducts surveys, including field surveys among directors of related tourism organizations and postal questionnaire ones among managers of tourism sectors.

In the last two decades, a considerable number of studies have discussed tourism disaster management planning, mainly focusing on conceptual framework including preparedness, mitigation, response, recovery based on disaster theories [4–5], and strategies to improve the business model of disaster management system [8]. In addition to this, researchers widely discussed perceived travel risks from the perspective of tourism demand [9–10]. But few mentioned risk perception and actual preparedness for disasters from tourism supply especially tourism sectors [11]. This study examines tourism sector preparedness in the area with high seismic risks, and furthermore, explores inter-relationship among main variables, risk perception, threat knowledge, disaster preparedness and earthquake preparedness that may impact whole preparedness level.

To date, increasing studies have investigated preparedness for disasters and discussed factors that are related to disaster preparedness. Numerous researchers have demonstrated that preparedness is associated with demographic characteristics, including age [12], gender [13], and education [14]. Besides these variables, psychological or personal factors have also been discussed in disaster preparedness, such as previous disaster experience [12]. Meheux and Parker [15] demonstrated that the perception of natural hazards held by tourism manager's influence the adoption of preparedness measures and emphasized the importance to improve knowledge of hazards in preparedness. As the perception of natural disasters held by tourism managers may influence the adaption of appropriate mitigation and preparedness measures and thus, decrease vulnerability and increase sustainability [15], among various factors influencing preparedness, this study mainly discusses the inter-relationship among disaster preparedness, earthquake preparedness, risk perception and threat knowledge.

2 CONCEPTUAL FRAMEWORK AND HYPOTHESIS

2.1 Model construction

Disaster preparedness refers to measures to prepare for, mitigate or prevent the effects of disasters. It encompasses measures aimed at enhancing life safety when a disaster occurs, or actions designed to enhance the ability to undertake emergency actions in order to protect property and contain disaster damage and disruption, as well as the ability to engage in post-disaster restoration and early recovery activities [16]. Fire disasters are regarded as the major threaten for tourism sectors, especially for hotels. Therefore, fire safety management has been widely discussed [17]. However, earthquakes are special disasters because they frequently cause many other kinds of disasters, such as conflagrations and tsunami. Therefore, in this study, we would discuss disaster preparedness and earthquake preparedness respectively, and divide them into different latent variables.

2.1.1 Threat knowledge and risk perception

Threat knowledge is a term, which describes an individual's awareness and understanding of natural hazards in their region [18]. Risk perception refers to how individuals judge and evaluate the risks posed by a range of hazards (risk sources) [19–21]. Threat knowledge and risk perception have been linked to hazard salience, level of past activity and contact with hazard information sources [22–23]. Perceptions of a specific natural hazard are affected by a number of factors, including personal awareness, past damage and contact with information

sources, as well as a range of cultural and societal factors. To date, several researchers have discussed the relationship between threat knowledge and risk perception. Orchiston [21] demonstrated that an individual's knowledge of hazard threat can influence risk perception. An individual's knowledge of hazard threat and risk reduction activities can influence risk perception, and in turn, emergency preparedness [21]. Wallquist *et al*. [24] illustrated lack of knowledge would influence risk perception of Carbon Dioxide Capture and Storage.

Many other researchers also demonstrated that hazard awareness or knowledge influences risk perception [25–26]. Perceived risk has been linked to proximity to the hazard source, perceived likelihood of future disasters, and the perceived extent of impact, as well as past experience in disasters [26]. In the case of tourism sector, if managers are aware or have a better understanding of earthquake hazards, it would affect the perception about the hazards and damages. Based on the above analysis, the following hypothesis is proposed.

H1: Risk perception is positively affected by the threat knowledge of managers in tourism sectors.

2.1.2 Risk perception and preparedness

Though several researchers suggest that the correlation between risk perception and disaster preparedness is not significant [27], perceptions are regarded as one driving mechanism for preparedness [25–26], and numerous studies have demonstrated that risk perception is directly associated with preparedness [28–29]. In a case study conducted on a group of people living in an alpine valley in the north of Italy, Miceli *et al*. [30] showed that disaster preparedness was positively associated with perception of flood risk. Similarly, Eisenman *et al.* [31] argue that perceived risk of and vulnerability to a disaster may lead people to prepare for a disaster and those who felt at risk were more likely to prepare. Similar findings have also been reported in the studies conducted on samples of residents exposed to seismic hazards in Wellington, New Zealand [32]. On this basis, the following hypothesis is proposed:

H2: Risk perception positively affects disaster preparedness.

H3: A higher risk perception helps promote earthquake preparedness.

2.1.3 Threat knowledge and preparedness

It is frequently discussed that increasing an individual's awareness of hazards will result in an increase in their levels of preparedness for natural disasters [33]. Groves [34] suggested that knowledge about hazards had a significant positive relationship to the perceived level of personal emergency preparedness, and indicated that the higher the perceived knowledge of the four types of emergencies (natural disaster, terrorism, hazardous materials, and disease outbreak), the higher the perceived level of preparedness. Therefore, the fourth hypothesis is given:

H4: A higher level of threat knowledge produces better disaster preparedness.

A disaster is a large and sudden misfortune or calamity such as fire outbreaks, floods, drought, earthquake, etc. that disrupt normal pattern of life within a community where people are plunged into helplessness and suffering beyond their capacity to cope, anticipate and recover from the effects of the disaster [35]. Disaster preparedness is influenced by a number of demographic and psychological factors. Paton *et al*. [36] described a sequential psychological process towards improving an individual's level of preparedness was described, in terms of intentions, motivations and actions [21]. Researchers noticed a series of crises and disasters had effect on hospitality industry, such as fire disasters [37–38], terrorist attacks [39–40], infectious disease [41–42].

Hotels have been categorized as high-risk buildings, especially for fire disasters, because of the presence of highly flammable materials and the chance of pervasion of smoke and fire to the rest of the building or even to neighboring buildings [43]. Therefore, fire disasters are paid much more attention than others. Many studies have examined how to deal with fire disasters and crisis management strategies, but very few studies were undertaken to explore the preparedness for earthquake disasters in the hospitality industry. Earthquakes, unlike other disasters such as hurricanes, are unpredictable, often destructive and even deadly. Earthquake preparedness is often overlooked. Due to the characteristics of earthquake, earthquake preparedness activities are different from general disaster preparedness one. For example, 'Drop, cover and hold on' has been suggested as one of the most reliable, simple and easiest approach that is used for teaching public on earthquakes [44]. Therefore, in this study we hypothesize that if tourism sectors think higher level of general disaster preparedness, they will also concern earthquake preparedness more.

H5: The level of disaster preparedness positively impacts earthquake preparedness.

Emergency preparedness or disaster preparedness refers to the steps an individual can take to actively protect themselves during and after a disaster event [23]. Getting prepared for a disaster can involve simple mitigation measures, otherwise known as hazard adjustments that can significantly improve safety and response to the disaster. Preparedness means knowing about the hazards that can affect you personally, and becoming educated about the likely outcomes of a particular hazard and how to protect yourself during the event e.g. 'drop, cover and hold' in an earthquake.

Paton *et al*. [45] described a three-stage reasoning process involved in an individual taking steps towards getting prepared. The first phase is motivation to prepare, which is driven by an individual's risk perception, critical awareness (knowledge and awareness of the hazard) and hazard anxiety. If these three factors are present at sufficient levels, motivation is translated into intention to prepare; the second phase of preparedness.

Mahdaviazad and Abdolahifar [46] assessed household natural disaster preparedness in Shiraz, Iran and found out that the knowledge of disasters have had a crucial role in preparedness. Preparedness is motivated by perception of hazard effects capable of posing a threat [47]. Thomas *et al*. [48] found that compared with persons with basic preparedness knowledge, persons with advanced knowledge were more likely to have assembled an emergency kit (44% versus 17%), developed a written household disaster plan (9% versus 4%), and received county emergency alert notifications (63% versus 41%).

Lindell and Whitney [23] and Paton *et al*. [36] highlighted that both individuals and business owners lack the necessary knowledge and resources to implement preparedness strategies. Corrigan [49] pointed out that because of lack of education or threat knowledge, Australian hospital staff was under-prepared to respond to disasters and it had become one of the main barriers to improving disaster preparedness. Shaw *et al*. [14] also illustrated the importance of knowledge about earthquakes in earthquake preparedness and explained that education can be as an effective way to provide information as the knowledge base for earthquake. Therefore, on the basis of existing literature review, the relationship between threat knowledge and earthquake preparedness is hypothesized as follows:

H6: The level of earthquake preparedness is positively affected by threat knowledge.

Therefore, we hypothesized that risk perception, threat knowledge, disaster preparedness, and earthquake preparedness were correlated, in accordance with the authors' previous research [50]. Figure 1 displays the hypothetical model and the hypotheses are listed as follows:

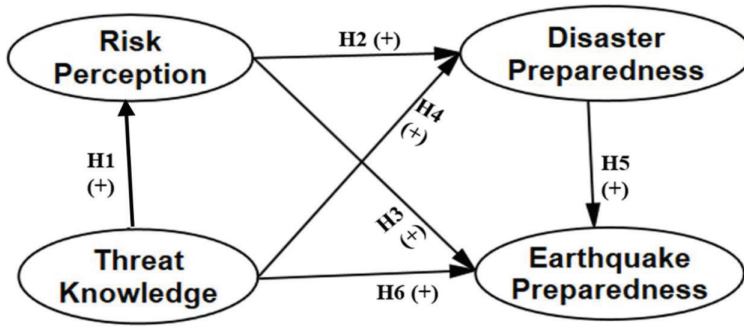

Figure 1: The hypothesized structural model.

H1: Risk perception is positively affected by the threat knowledge of managers in tourism sectors.
H2: Risk perception positively affects disaster preparedness.
H3: A higher risk perception helps promote earthquake preparedness.
H4: A higher level of threat knowledge produces better disaster preparedness.
H5: The level of disaster preparedness positively impacts earthquake preparedness.
H6: The level of earthquake preparedness is positively affected by threat knowledge.

2.2 Measurement model

Measurement model is part of the model that explores the relationships between the latent variables and their measures or observed variables. In this study, we constructed a model with four latent variables and the measures of threat knowledge, risk perception, and earthquake preparedness were measured using a five-point Likert type scale which was proposed by Likert [51]. Likert scales required respondents to select an answer from a five-point range of possible options. The questions representing the observed variables of risk perception, threat knowledge, and earthquake preparedness were measured using a five-point Likert item. The item of risk perception was measured using 5-point Likert-type scales, ranging from 1 (very unlikely) to 5 (very likely), and the threat knowledge was scaled using not at all – greatly format. Earthquake preparedness was also assessed using 5-point Likert-type scales from 1 (completely unprepared) to 5 (completely prepared). In measurement models, the relationship between the observed and latent variables is specified, and causality flows from the latent variables to the indicators. Figure 2 shows the measurement models for the latent variables.

3 DATA AND METHODS

3.1 Interviews with supervisors in tourism organizations

We conducted semi-structured, in-depth interviews in January and February 2013. The interviewees were mainly the supervisors from the tourism organizations of the earthquake-damaged areas in Kobe, Awaji, and Tohoku, as well as Tokyo in which it is estimated there is a high risk that earthquake disasters will occur. The results showed that there was no special disaster plans

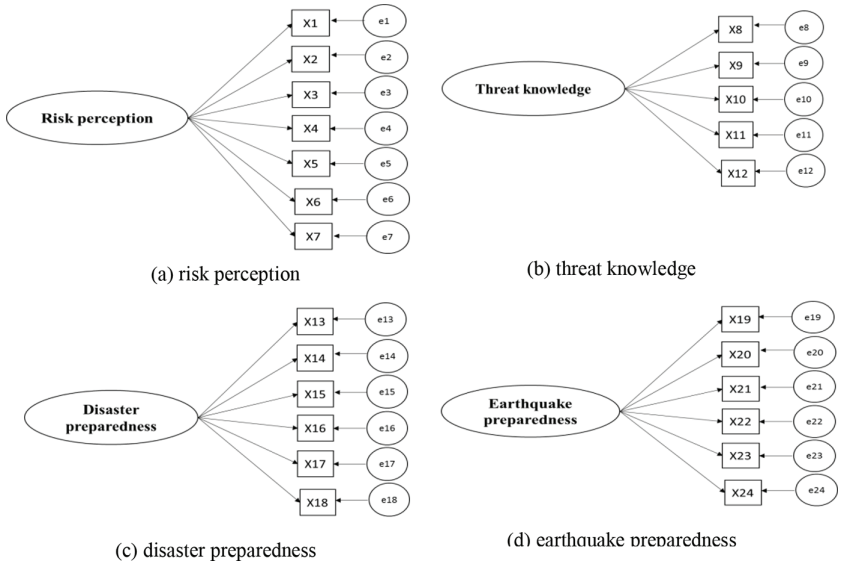

Figure 2: Measurement models.

or business continuity management plans for tourism industry. When the interviewees were asked how to protect foreign tourists when disasters happen, respondents explained they had been providing disaster maps in various languages for foreign guests. Apart from lack of tourism disasters or business continuity management plans, there was no disaster prevention plans especially for earthquakes. The respondents from Tokyo thought that visitors spent much time in accommodation facilities, accommodation facilities should have disaster prevention plans for domestic and inbound tourists and be well-prepared for all kinds of disasters.

3.2 Pilot investigation and postal survey

With the aim to checking the validity of the questionnaire that we proposed to conduct survey, a pilot investigation was made from March 2 to 9, 2014. During the time, we have made face-to face interviews among the staff working in restaurants and hotels near Ueno, Shinnbuya, Shinagawa, Asakusa Kita Senju, and Tokyo Stations. The questions mainly referred to disaster prevention and preparedness, such as 'do you know whether there is a disaster prevention plan in the restaurants (hotel) you are working for?', 'what do you think of the estimated Tokyo Inland Earthquake?', 'have you attended disaster prevention drills?'. On the basis of the pilot survey results, we updated our questionnaire.

We conducted a postal survey among managers of accommodation facilities and restaurants in the capital area of Japan, including Tokyo, Chiba, Kanagawa, and Saitama Prefectures, to investigate how the tourism industry was prepared for disasters, especially for earthquakes. The address lists were derived from hotel (Yahoo Japan, booking.com) and restaurant booking websites (ぐるなび). Receivers were managers in charge of the section.

In the survey, a total of 2,000 postal questionnaires were sent to hotels (1,652) and restaurants near Tokyo bay (348) from March 15 to 31, 2014. A total of 333 questionnaires were returned, accounting for a response rate of 16.7%. Then, reliability and validity analyses were made to

test the measurement model fit. Lastly, we used structural equation modeling (SEM) analysis with the software Analysis of Moment Structures software (AMOS) version 22 to test the model.

4 DATA ANALYZING AND RESULTS

4.1 Personal and business information

Table 2 presents the demographic information profile of the respondents in this study, including basic demographic characteristics (e.g. age, length of service, and educational level). According to Table 1, the majority of respondents were over 46 years old and worked at least 11 years. More than half (55.4%) experienced education level beyond high school.

According to Table 3 showing the surveyed business profile, among the recycling effective questionnaires, the questionnaire from Tokyo took up 44.2%. Of these tourism sectors, near 60% employed less than 10 full-time employees. The vast majority of the respondent businesses (94.2%) were hotels.

4.2 Reliability analysis and validity analysis

4.2.1 Reliability analysis

Cronbach's Alpha is an index of reliability associated with the variation and is regarded as one of the most popular tools to assess the reliability scales. Nunnally [52] recommends that the minimum acceptable coefficient alpha is 0.6. Cronbach's alpha for all items is 0.737. However, the measures for risk communication (0.433) and perceived resilience (0.385) do not reach the recommended minimum acceptable level of 0.6. It is pointed out that low stabilities produce a rapidly changing variable within the time interval studied, and if the measures have low reliability, then the variable can be problematic for any structural modeling [53]. Therefore, the latent variables of risk communication and perceived resilience are not ideal to be taken into the construct models. Table 4 shows the Cronbach's Alpha of reliability test for latent variables.

4.2.2 Validity analysis

Validity analysis assesses whether observed variables truly measure the corresponding variables. The validity of the scales is tested by the Kaiser-Meyer-Olkin (KMO) and Bartlett's test. Kaiser [54] suggests that it is not desirable but acceptable if the value of KMO is between 0.6 and 0.7, good between 0.7 and 0.8, very good between 0.8 and 0.9, and it is considered excellent if the value is more than or equals to 0.9. Table 5 lists the results of the KMO and Bartlett's test. According to the results, the KMO value of risk perception is acceptable, and the other three KMO values are good or very good, and the sig. values (or p value) of the Bartlett's test are all less than 0.05. Therefore, the items of the observed variables preferably scale the latent variables.

4.3 Structural equation modeling analysis

4.3.1 Estimation of parameters

Figure 3 presents the initial conceptual model for estimation, in which r1, r2 and r3 are errors for latent variables, and the items from e1 to e24 are residual or error variances. In order to better identify the scale of the latent variables, one of the path coefficients for each latent variable to observed variables is set to 1. And the residuals, r1, r2 and r3, are also set to 1.

Table 1: Latent constructs, observed variables and scales.

Latent variable	Oberserved variable	Note	Reference
Risk perception (7)	What do you think of the impact of *flood* on your habitat? (x1) What do you think of the impact of *drought* on your habitat? (x2) What do you think of the impact of *storm* on your habitat? (x3) What do you think of the impact of *tornado* on your habitat? (x4) What do you think of the impact of *earthquake* on your habitat? (x5) What do you think of the impact of *tsunami* on your habitat? (x6) What do you think of the impact of *volcano* on your habitat? (x7)	Adopting the Likert - Scale five - point measure the items	Finnis (2005), Orchiston (2010)
Threat knowledge (5)	What do you think of threat of the estimated earthquake to *your personal safety*? (x8) What do you think of threat of the estimated earthquake to *your family member*? (x9) What do you think of threat of the estimated earthquake to *your property*? (x10) What do you think of threat of the estimated earthquake to *your business*? (x11) What do you think of threat of the estimated earthquake to *your habitat*? (x12)	Adopting the Likert - Scale five - point measure the items	Finnis (2005), Orchiston (2010)
Disaster preparedness (6)	Does your business have emergency response drill for staff? (x13) Does your business organize disaster drill? (x14) Have your business bought insurance for hazards? (x15) Does your business have written disaster prevention plan? (x16) Does your business have evacuation guidance for visitors? (x17) Does your business have evacuation guidance for foreign tourists? (x18)	1=Yes 2=No	Finnis (2005), Orchiston (2010)
Earthquake preparedness (6)	What do you think of preparedness of yourself for the earthquake? (x19) What do you think of preparedness of your community for the earthquake? (x20) What do you think of preparedness of your business for the earthquake? (x21) What do you think of preparedness of the local council for the earthquake? (x22) What do you think of preparedness of central government for the earthquake? (x23) What do you think of preparedness of country for the earthquake? (x24)	Adopting the Likert - Scale five - point measure the items	Finnis (2005), Orchiston (2010)

Table 2: Demographic information.

Variable	N	Percentage (%)
Age		
under 20	2	0.6
21~45	132	41.1
46~65	143	44.5
≥ 66	44	13.7
Length of service		
Less than 1 year	16	5.0
1~2 years	17	5.3
3~5 years	43	13.5
6~10 years	69	21.6
11 years or above	174	54.5
Education level		
Senior School or less	81	25.6
Technical/Vocational college	60	19.0
Graduate school or above	175	55.4

The standardized regression weights indicated that some of the hypothesized paths were not significant, including the path form risk perception to disaster preparedness, threat knowledge to earthquake preparedness, risk perception to earthquake preparedness, and disaster preparedness to X15. Therefore, we tired to remove the former two insignificant paths, and the modified model 1 was obtained. The Goodness-of-fit measures were shown in Table 6.

Table 3: Business information.

Variable	N	Percentage (%)
Business location		
Saitama Prefecture	20	6.3
Kanagawa Prefecture	79	24.8
Chiba Prefecture	79	24.8
Tokyo	141	44.2
Full-time employee	319	
Less than 4	100	34.2
5~9	72	24.7
10~49	85	29.1
≥ 50	35	12.0
Types		
Restaurant	19	5.8
Hotel	309	94.2

Table 4: Reliability test for latent variables.

Latent variable	Cronbach's alpha
Risk perception (7)	0.661
Threat knowledge (6)	0.858
Disaster preparedness (6)	0.635
Earthquake preparedness (6)	0.816

Table 5: KMO and Bartlett's test.

		Risk perception	Threat knowledge	Disaster preparedness	Earthquake preparedness
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.666	.832	.742	.789
Bartlett's test of sphericity	Approx. Chi-Square	385.084	773.979	234.837	1092.188
	df	21	10	15	15
	Sig.	.000	.000	.000	.000

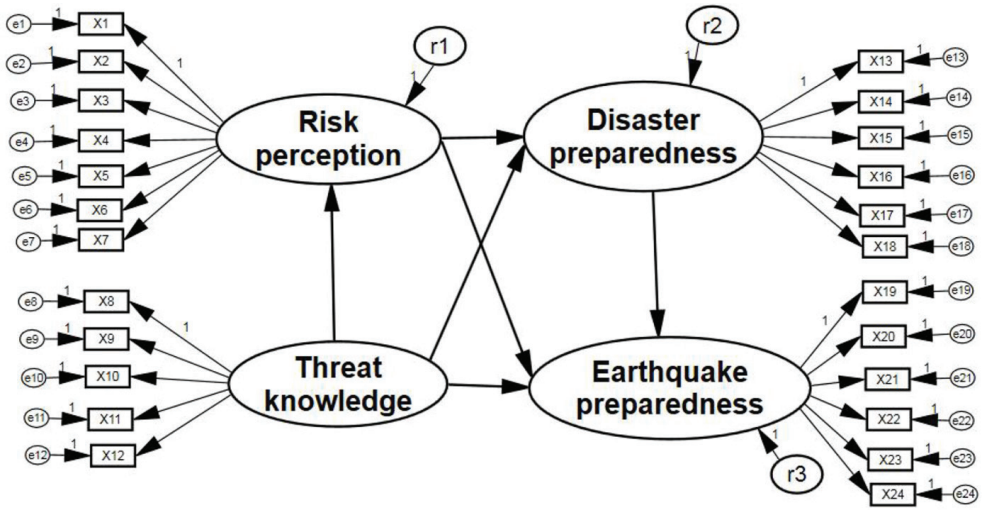

Figure 3: Initial model for estimation.

Table 6: Goodness-of-fit measures.

Model	CMIN	DF	CMIN/DF	GFI	CFI	RMSEA
Initial model	569.891	246	2.317	0.871	0.876	0.063
Modified model 1	547.774	226	2.424	0.87	0.877	0.065
Modified model 2	548.606	227	2.417	0.87	0.877	0.065
Modified model 3	393.505	223	1.765	0.908	0.935	0.048

Note: CMIN—Chi-Squared values; GFI—Goodness of fit index; CFI—Comparative Fit Index; RMSEA—Root Mean Square Error of Approximation

4.3.2 Model modification

Modification indices were examined in order to identify parameter misfit. David [55] explains that other some specification errors can explain a large modification index, and some modification indices may be implausible and should be ignored. Modification indices indicate how much the Chi-square value of the overall model would decrease if a parameter was freely estimated instead of constrained. We used the modification indices and expected parameter changes for the factor loadings and measurement intercepts by a conclusive test of measurement equivalence to provide possible model improvement. According to the modification indices and values of parameter change, possible correlations between indicator measurement errors were not previously specified in the model under inspection. Some errors were connected together until the best improvement in fit was achieved. Based on the principles we mentioned above, we gradually modified the initial model and obtained the modified model 3 shown in Fig. 4 Table 4 shows the goodness-of-fit measures of modified model 1, modified model 2 and modified model 3.

4.3.3 Model assessment and model fit

If the modified models had a good model fit, the ratio of χ^2 and the number of degrees of freedom, that is CMIN/DF, should be as small as possible. By convention, if the goodness-of-fit index (GFI) is greater 0.95, there is a good level of fit, whereas if the value is between

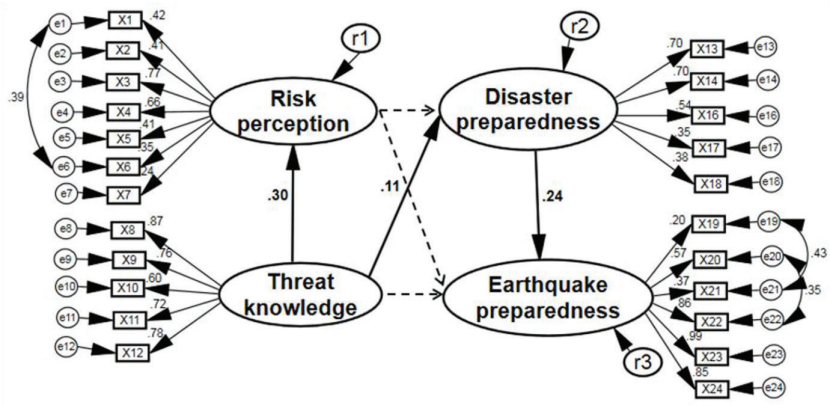

Figure 4: Modified model 3 (Modified model of Figure 3).

0.90 and 0.95, the GFI is regarded as acceptable level. The rule of thumb for the comparative fit index (CFI), there is a good fit if the value is greater than 0.90. There is a good model fit if the root mean square error of approximation (RMSEA) is less than or equals to 0.05. If RMSEA is between 0.08 and 0.10, there is an acceptable fit. But if RMSEA is above 0.1, the model has a poor fit. On the basis of these criterions and the goodness of fit measures shown in Table 6, modified model 3 was superior to the others considered as the final model.

4.4 Results

The results of the structural coefficients shown in Fig. 4 were used to examine the hypotheses of this study. The empirical results supported the proposed hypotheses: H1 risk perception is positively affected by the threat knowledge of managers in tourism sectors, H4 a higher level of threat knowledge produces better disaster preparedness, and H5 the level of disaster preparedness positively impacts earthquake preparedness. The hypotheses (H2 risk perception positively affects disaster preparedness, H3 a higher risk perception helps promote earthquake preparedness and H6 the level of earthquake preparedness is positively affected by threat knowledge.) were rejected.

As Fig. 4 illustrated, the path from threat knowledge to risk perception yielded a significant coefficient value of 0.3 at 0.01 significance level; thus, the hypothesis was supported by the findings. In addition, the path from threat knowledge to disaster preparedness had a value of 0.11, significant at 0.10 level, thereby confirming the hypothesis 4 that the perception of managers impacted their perception of risk. According to Fig. 4, the link between disaster preparedness and earthquake preparedness produced a coefficient value of 0.24 and was significant at 0.05 level. Hence, it can be inferred that disaster preparedness had a significant and positive effect on earthquake preparedness, supporting the hypothesis 5. Thus, the risk perception had no significant positive effect on (hypothesis 2) nor earthquake preparedness (hypothesis 3) and H6 the level of earthquake preparedness was positively affected by threat knowledge. Meanwhile, the findings indicated that threat knowledge was not positively associated with earthquake preparedness.

The findings further indicated the path from the latent variable of disaster preparedness to the observed variables (X13, X14, X16, X17) is all significant and the coefficients to X13 (does your business organize emergency response drills for the staff?) and X14 (does your business organize disaster drills?) were greater than the others. Thus we can infer that it would be greatly helpful to improve earthquake preparedness by organizing emergency response training drills for the staff and organizing disaster drills contribute greatly to earthquake preparedness.

5 CONCLUSION

This study examined disaster preparedness issue in the context of seismic risk from tourism sector's perspective. With the aim to investigate the disaster preparedness of tourism sectors in high seismic risk areas, we proposed a conceptual model and hypothesized the relationship among threat knowledge, risk perception, disaster preparedness and earthquake preparedness. The data used in this study was mainly collected by postal surveys focusing on the National Capital Region of Japan and SEM was employed to test the proposed conceptual model. Our findings indicate that threat knowledge is a significant factor not only for risk perception, but also for disaster preparedness, and disaster preparedness is positively related to earthquake preparedness. Risk perception has no significant effect on disaster preparedness and

earthquake preparedness. Indeed, these findings match Bourque *et al*.'s [28] conclusions that risk perception does not have a significant direct effect on disaster preparedness, and that its effect is largely influenced by knowledge and perceived efficacy.

This study provides important theoretical and practical contributions to the disaster preparedness in high seismic risk area. The findings indicate that the tourism sectors in the capital region of Japan are well prepared for disasters and have developed emergency response plans for the staff and organized training drills. We developed a theoretical model for disaster preparedness and earthquake preparedness and verified the importance of threat knowledge in disaster and earthquake preparedness. It would be helpful to deal with the current difficulties that disaster evacuation for foreign visitors was less considered in disaster planning (only 40%), and few of the sectors bought insurance for disasters (22.8%). On the basis of the results of this study, it would be efficient to improve disaster preparedness level by improving threat knowledge. The findings may shed light on the organizations related to disaster prevention and mitigation and help them to draw up policies and measures to improve disaster preparedness in high seismic risk areas.

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REFERENCES

[1] Japan Tourism Agency, Ministry of Land, Infrastructure, Transport and Tourism: accommodation statistics, http://www.mlit.go.jp (accessed 23 December 2014).

[2] Sönmez, S.F. & Graefe, A.R., Influence of terrorism risk on foreign tourism decisions. *Annals of Tourism Research*, **25(1)**, pp. 112–144, 1998. https://doi.org/10.1016/s0160-7383(97)00072-8

[3] Sönmez, S.F., Apostolopoulos Y. & Tarlow P., Tourism in crisis: managing the effects of terrorism. *Journal of Travel Research*, **38(1)**, pp. 13–18, 1999. https://doi.org/10.1177/004728759903800104

[4] Ritchie, B., Tourism disaster planning and management: From response and recovery to reduction and readiness [J]. *Current Issues in Tourism*, **11(4)**, pp. 315–348, 2008. https://doi.org/10.1080/13683500802140372

[5] Faulkner, B., Towards a framework for tourism disaster management. *Tourism Management*, **22(2)**, pp. 135–147, 2001. https://doi.org/10.1016/s0261-5177(00)00048-0

[6] Wu, L.H. & Hayashi, H., The impact of the Great East Japan Earthquake on inbound tourism demand in Japan. *Journal of Institute of Social Safety Science*, **21**, pp. 109–117, 2013.

[7] Wu, L.H. & Hayashi, H., The impact of disasters on Japan's inbound tourism demand. *Journal of Disaster Research*, **9**, pp. 699–708, 2014. https://doi.org/10.20965/jdr.2014.p0699

[8] Inkyu, J., Jiwon, S., Jungtak, L., Jaeho, J. & Jinyoung, K., Improvement of the business model of the disaster management system based on the service design methodology. *International Journal of Safety and Security*, **6(1)**, pp. 19–29, 2016. https://doi.org/10.2495/safe-v6-n1-19-29

[9] Rittichainuwat, B.N. & Chakraborty, G., Perceived travel risks regarding terrorism and disease: The case of Thailand. *Tourism Management*, **30(3)**, pp. 410–418, 2009. https://doi.org/10.1016/j.tourman.2008.08.001

[10] Wu, L.H. & Hayashi, H., An analysis of tourist perception and attitude toward disasters: a case study of recent Chinese large earthquake disasters. *Journal of Institute of Social Safety Science*, **24**, pp. 311–320, 2014.

[11] Orchiston, C., Tourism business preparedness, resilience and disaster planning in a region of high seismic risk: the case of the Southern Alps, New Zealand. *Current Issues in Tourism*, **16(5)**, pp. 477–494, 2013.

[12] Sattler, D.N., Kaiser, C.F. & Hittner, J.B., Disaster preparedness: relationships among prior experience, personal characteristics, and distress. *Journal of Applied Social Psychology*, **30(7)**, pp. 1396–1420, 2000.

[13] Newport, J.K. & Jawahar, G.G.P., Community participation and public awareness in disaster mitigation. *Disaster Prevention and Management: An International Journal*, **12(1)**, pp. 33–36, 2003.

[14] Shaw, R., Shiwaku Hirohide Kobayashi, K. & Kobayashi, M., Linking experience, education, perception and earthquake preparedness. *Disaster Prevention and Management: An International Journal*, **13(1)**, pp. 39–49, 2004.

[15] Meheux, K. & Parker, E., Tourist sector perceptions of natural hazards in Vanuatu and the implications for a small island developing state. *Tourism Management*, **27(1)**, pp. 69–85, 2006.

[16] Sutton, J. & Tierney, K., Disaster preparedness: concepts, guidance, and research. *Boulder*, University of Colorado Natural Hazards Center, Institute of Behavioral Science, 2006.

[17] Chen, Y.Y., Chuang, Y.J., Huang, C.H., Lin, C.Y. & Chien, S.W., The adoption of fire safety management for upgrading the fire safety level of existing hotel buildings. *Building and Environment*, **51**, pp. 311–319, 2012.

[18] Johnston, D., Bebbington, M.S., Lai, C.D., Houghton, B.F. & Paton, D., Volcanic hazard perceptions: comparative shifts in knowledge and risk. *Disaster Prevention and Management*, **8(2)**, pp. 118–126, 1999(a).

[19] Renn, O., Concepts of risk: a classification. *In Social Theories of Risk*, ed. S.K. a. D. Golding, London: Praeger, 53–82, 1992.

[20] Rohrmann, B., The role of risk communication in processes in disaster preparedness. In *Sharing the Future - Risk Communication in Practice*, ed. J. Gough, Christchurch: University of Canterbury, 2003.

[21] Orchiston, C.H., *Tourism and Seismic Risk: Perceptions, Preparedness and Resilience in the Zone of the Alpine Fault*, Southern Alps, New Zealand[D]: University of Otago, 2010.

[22] Perry, R.W. & Lindell, M.K., *Living with Mount St. Helens: Human adjustment to volcano hazards*, 1990.

[23] Lindell, M.K. & Whitney, D., Correlates of household seismic hazard adjustment adoption. *Risk Analysis*, **20(1)**, pp. 13–25, 2000.

[24] Wallquist, L., Visschers, V.H.M. & Siegrist, M., Impact of knowledge and misconceptions on benefit and risk perception of CCS. *Environmental Science & Technology*, **44(17)**, pp. 6557–6562, 2010.

[25] Siegrist, M. & Cvetkovich, G., Perception of hazards: The role of social trust and knowledge[J]. *Risk Analysis*, **20(5)**, pp. 713–720, 2000.

[26] Chen, H.-S., The study of the relationship among environmental cognition, attitude, sensitivity, and behavior: The case of an eco-resort island. *International Journal of Safety and Security*, **5(4)**, pp. 352–358, 2015.
[27] Paton, D., Smith, L. & Johnston, D.M., Volcanic hazards: risk perception and preparedness. *New Zealand Journal of Psychology*, **29(2)**, p. 86, 2000.
[28] Bourque, L,B., Regan, R., Kelley, M., Wood, M.M., Kano, M. & Mileti, D.S., An examination of the effect of perceived risk on preparedness behavior. *Environment & Behaviour*, **45(5)**, pp. 615–649, 2013.
[29] Kim, Y.C. & Kang, J., Communication, neighborhood belonging and household hurricane preparedness. *Disasters*, **34(2)**, pp. 470–488, 2010.
[30] Miceli, R., Sotgiu, I. & Settanni, M., Disaster preparedness and perception of flood risk: A study in an alpine valley in Italy. *Journal of Environmental Psychology*, **28(2)**, pp. 164–173, 2008.
[31] Eisenman, D.P., Wold, C., Fielding, J., Long, A., Setodji, C., Hickey, S. & Gelberg, L., Differences in individual-level terrorism preparedness in Los Angeles County. *American Journal of Preventive Medicine*, **30(1)**, pp. 1–6, 2006.
[32] Spittal, M.J., McClure, J., Siegert, R.J. & Walkey, F.H., Predictors of two types of earthquake preparation: survival activities and mitigation activities. *Environment and Behavior*, **40(6)**, pp. 798–817, 2008.
[33] Martin, I.M., Bender, H. & Raish, C., What motivates individuals to protect themselves from risks: the case of wildland fires. *Risk Analysis*, **27(4)**, pp. 887–900, 2007.
[34] Groves, S., Knowledge, involvement and emergency preparedness. *Dissertations & Theses - Gradworks*, 2013.
[35] Hyogo Framework for Action 2005–2015: *Building the Resilience of Nations and Communities to Disasters*. World Conference on Disaster Reduction. 18–22 January 2005, Kobe, Hyogo, Japan. 2005.
[36] Paton, D., Ronan, K., Johnston, D., Smith, L. & Johnston, M., Responding to earthquake hazards: promoting household resilience and preparedness. *Paper Presented at the 2003 Pacific Conference on Earthquake Engineering*, Christchurch, New Zealand, 2003. http:// db.nzsee.org.nz/PCEE/2003/Print/Paper166p.pdf
[37] Hystad, P.W. & Keller, P.C., Towards a destination tourism disaster management framework: Long-term lessons from a forest fire disaster. *Tourism Management*, **29(1)**, pp. 151–162, 2008.
[38] Buerk, C.A., Batdorf, J.W., Cammack, K.V., *et al*. The MGM Grand Hotel fire: lessons learned from a major disaster. *Archives of Surgery*, **117(5)**, pp. 641–644, 1982.
[39] Stafford, G., Yu, L. & Armoo, A.K., Crisis management and recovery: How Washington, DC, hotels responded to terrorism. *Cornell Hotel and Restaurant Administration Quarterly*, **43(5)**, pp. 27–40, 2002.
[40] Kosová, R. & Enz, C.A., The terrorist attacks of 9/11 and the financial crisis of 2008: The impact of external shocks on US hotel performance. *Cornell Hospitality Quarterly*, **53(4)**, pp. 308–325, 2012.
[41] Henderson, J.C. & Ng, A., Responding to crisis: severe acute respiratory syndrome (SARS) and hotels in Singapore. *International Journal of Tourism Research*, **6(6)**, pp. 411–419, 2004.
[42] Kim, S.S., Chun, H. & Lee, H., The effects of SARS on the Korean hotel industry and measures to overcome the crisis: A case study of six Korean five-star hotels. *Asia Pacific Journal of Tourism Research*, **10(4)**, pp. 369–377, 2005.

[43] AlBattat, A.R. & Mat Som, A.P., Emergency preparedness for disasters and crises in the hotel industry. *Sage Open*, **3(3)**, 2013.
[44] Norton, G.A. & Leahy, P.P., *Putting Down Roots in Earthquake Country*, Your Handbook for the San Francisco Bay Region. US Geological Survey, 2007.
[45] Paton, D., Smith, L., Johnston, D., Johnson, M. & Ronan, K., Developing a model to predict the adoption of natural hazard risk reduction and preparatory adjustments. *Earthquake Commission Research Project Number* 01–479. Wellington: Earthquake Commission, 2003.
[46] Mahdaviazad, H. & Abdolahifar, G., Assessing household natural disaster preparedness in Shiraz, Iran, 2011: results of a knowledge, attitude, and practices survey[J]. *Disaster Medicine & Public Health Preparedness*, **8(4)**, pp. 349–352, 2014.
[47] Johnston, D., Paton, D., Crawford, G.L., Ronan, K., Houghton, B. & Bürgelt, P., Measuring tsunami preparedness in coastal Washington, United States. *Natural Hazards*, **35(1)**, pp. 173–184, 2005.
[48] Thomas, T.N., Leandergriffith, M., Harp, V. & Cioffi, J.P., Influences of preparedness knowledge and beliefs on household disaster preparedness. *Mmwr Morb Mortal Wkly Rep*, **64(35)**, pp. 965–971, 2015.
[49] Corrigan, E. & Samrasinghe, I., Disaster preparedness in an Australian urban trauma center: staff knowledge and perceptions. *Prehospital & Disaster Medicine*, **27(5)**, pp. 1–438, 2012.
[50] WU Lihui, T., *Earthquake Disaster Preparedness for Tourism Industry in Japan and China*, [D]. Kyoto University, 2015.
[51] Likert, R., A technique for the measurement of attitudes. *Archives of Psychology*, **140**, pp. 1–55, 1932.
[52] Nunnally, J.C., Bernstein, I.H. & Berge, J.M.F., *Psychometric Theory*, New York, NY: McGraw-Hill, 1967.
[53] Geoffrey, M., *Basics of Structural Equation Modeling*, Sage, 114, 1997.
[54] Kaiser, H.F., An index of factorial simplicity[J]. *Psychometrika*, **39(1)**, pp. 31–36, 1974.
[55] Kenny. D.A., Respecification of Latent Variable Models, September 11, 2011. http://davidakenny.net/cm/respec.htm (accessed 23 September 2014).