Earthquake Disaster Preparedness for Tourism Industry in Japan and China

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Abstract

Tourism in East Asia and the Pacific is thriving, driven by the swift economic development in this region. The United Nations World Tourism Organization (UNWTO) reported in 2001 that East Asia and the Pacific has been the fastest growing destination region over the past 30 years. Experts forecast that international tourist arrivals to the region will reach 397 million in 2020. However, tourism is sensitive to natural disasters, and indeed, the fluctuation in tourist arrivals is caused by external shocks. Hence, improving the resilience of tourism is crucial; in a society with high resilience, disasters would cause less damage, and businesses could better withstand disasters. This study takes Japan, a developed country, and China, a developing country, as cases to explore the impact of damaging earthquakes on tourism demand. The research will also investigate tourist perception, based on face-to-face structural interviews, and tourism sector preparedness, based on several types of surveys. On the basis of characteristics unique to tourism, this work intends to provide practicable propositions and suggestions for the tourism industry as regards earthquake preparedness.

These two earthquake-prone countries have experienced large losses in tourism business due to damaging earthquakes. Xinhua Net reported that the 2008 Wenchuan Earthquake, with a magnitude of Mw 8.0, killed 54 tourists in Sichuan province, and caused more than 50 billion RMB (7.24 billion USD) in damage to Sichuan's tourism sector as of June 13, 2008. The report released by the Japan National Tourism Organization in 2012 suggested that soon after the Great East Japan Earthquake, between March 12 and March 31, 2011, international visitor arrivals to Japan fell sharply by 72.7% compared with the same period in 2010. This research aims to improve tourism destination resilience in Japan and China.

Based on a review of tourism and disaster literature, most of the works examined disasters' impact on tourism demand, focusing on hazards, such as terrorist attacks, infectious epidemics, financial crises, and tsunamis. In addition, a large number of studies focused on disaster management models for the tourism industry. However, these models are largely similar to general disaster management models as they do not take into consideration the uniqueness of tourism disaster management. Research on earthquake-oriented disaster preparedness for the tourism industry is likewise sparse.

This doctoral thesis is divided into four sections. The first section presents the

vulnerability of tourist arrivals from damaging earthquakes, and then tests this aspect by applying the Autoregressive Integrated Moving Average (ARIMA) model with dummy variables. In the second section, intervention analysis is used to explore the main disasters that negatively and significantly impact tourism demand. The third section investigates tourist perception and attitude toward earthquakes using a case study on recent massive earthquake disasters in China, that is, from the perspective of tourism demand. The final section examines tourism sector preparedness in zones with high seismic risk using a case study on the National Capital Region of Japan.

Based on the studies mentioned above, four main results are drawn. First, damaging earthquakes significantly affect tourism demand, especially inbound tourism demand. Earthquake impact patterns can be divided into three periods: sharp decline, rapid rebound, and wandering. Second, compared with other disasters in earthquake-prone countries, damaging earthquakes are the main disasters that significantly affect tourism demand. Thus, earthquake-oriented disaster preparedness becomes necessary. Third, word of mouth plays an important role in the decision making of tourists regarding tourism destinations. Tourist satisfaction is directly impacted by the perceived impact of earthquakes on tourism, influenced by risk perception and travel motivation. On the basis of the survey, propositions are put forth to reduce risk perception and increase travel motivation. The respondent tourism businesses in the capital region of Japan were well prepared in terms of emergency response plan and drill, but they lacked disaster preparedness for foreign tourists. Apart from the decline of tourist arrivals, respondent managers worried about the staff shortage after the occurrence of the predicted Tokyo Inland Earthquake. The survey also revealed that few respondent businesses bought insurance for disasters. Most respondents were not clear about the earthquake preparedness of their community, council, central government, and country. The results based on the survey data analysis using structural equation modeling demonstrated that earthquake preparedness is impacted by the level of disaster preparedness, which in turn is affected by the threat knowledge of managers of tourism businesses.

These findings might shed light on policymaking for tourism destinations, and will help stakeholders form a better understanding of the impact of earthquakes on tourism. The research methodologies in the case studies concerning Japan and Sichuan in China can be applied to any other destination of interest to promote better preparedness against natural disasters.

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Chapter 1 Introduction

East Asia and the Pacific has been the fastest growing destination region over the past decades. However, tourism is especially vulnerable to a range of disaster occurrences because it depends greatly on numerous components and individual businesses (Murphy and Bayley, 1989). Tourism demand is sensitive to catastrophic influences, and part of its long-term volatility is attributed to the variety of shocks to the tourism system from external events (Frechtling, 2001). Fig. 1-1 presents the inbound tourist arrivals in China and Japan from 1995 to 2012. The trends show that the development of tourism in both countries is promising. However, shocks, such as earthquakes, have rendered negative effects on tourism demand. Meanwhile, the tourism industry is unique compared with other traditional industries characterized by commodity flows: if consumers of tourism (tourists or visitors) want to buy goods (mainly travel experience), they have to move to a tourism destination. Hence, general disaster management planning is not sufficient for the tourism industry. Currently, studies or discussions aiming at earthquake disaster preparedness specific to this industry are limited.

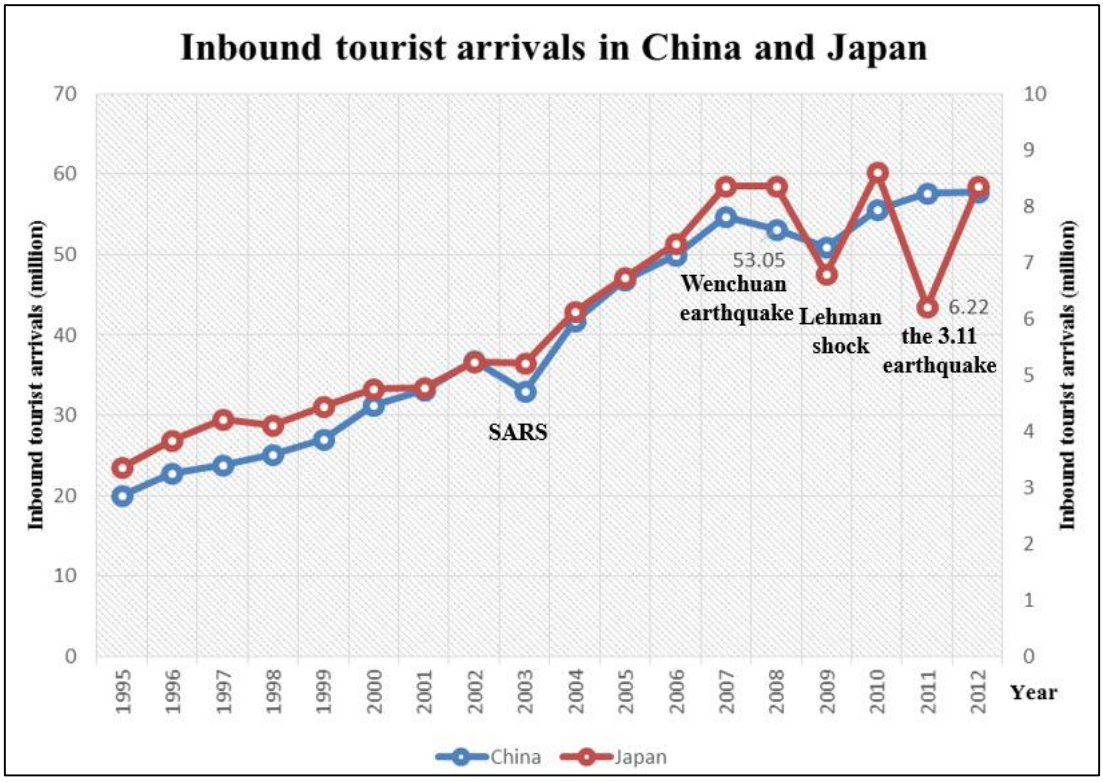


Fig. 1-1 Inbound tourist arrivals in China and Japan from 1995 to 2012.
(Data source: the World Bank http://data.worldbank.org/indicator/ST.INT.ARVL)

1.1 Tourism

1.1.1 Definition

Tourism has many definitions, each corresponding to the varied purposes of consumers (e.g., Wahab, 1975; Jafari, 1977; Leiper, 1979; McIntosh and Goeldner, 1990). Compared with other definitions, that given by the United Nations World Tourism Organization (UNWTO) has been widely accepted by most national statistical offices as the guide for obtaining statistics on international tourism. According to this definition, tourism "comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes (UNWTO, 1995)."

1.1.2 Components

Tourism mainly comprises three components, as shown in Fig. 1-2 (Goeldner and Ritchie, 2009): the tourist; catalyst, planning, development promotion, and management organization; and operating sectors. The component "tourist" represents tourism demand and covers tourist behavior, motivation, perception, and so on. "Catalyst, planning, development promotion, and management organizations," or "tourism organizations" in short, mainly comprise public sector components, such as official tourism departments, and private sector components, including non-government tourism industry associations. "Operating sectors" mainly refers to businesses that provide tourists what they need in food, hospitality and accommodation, traveling, shopping, and entertainment. Operating sectors consist of the travel, accommodation, tourism service, transportation, entertainment, food service, adventure or outdoor recreation, attraction, events, and travel trade sectors.

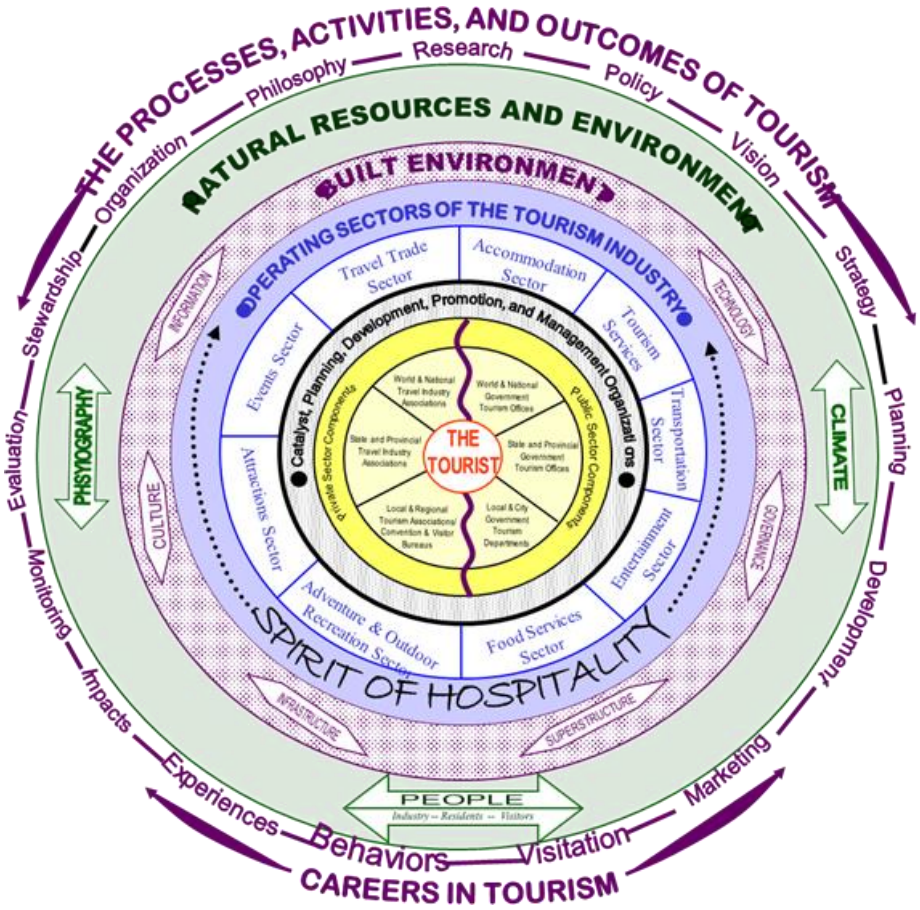


Fig. 1-2 Components of tourism and tourism management.
(Source: Goeldner and Ritchie, 2009)

1.2 Disaster and disaster preparedness

A disaster refers to a serious disruption of the functioning of a community or society involving widespread human, material, economic, and environmental losses and impacts that exceed the capability of the affected community or society to cope using its own resources (UNISDR, 2007).

Disaster preparedness encompasses measures aimed at enhancing life safety when a disaster occurs, such as protective actions during an earthquake, hazardous materials spill, or terrorist attack. It also includes actions designed to enhance the capability to undertake emergency actions to protect property and contain disaster damage and disruption, as well as the capability to engage in post-disaster restoration and early recovery activities (Sutton and Tierney, 2006).

1.3 Study sites

Japan, a developed country, and China, a developing country, are selected as case studies in view of the specific contexts of the two countries. First, they are representative of East Asia and the Pacific. Japan enjoys a reputation as a safe destination with its low crime rate, low risk for communicable diseases, and freedom from concerns for food safety. However, the Great East Japan Earthquake has marred this image of being a safe destination. (Takamatsu, 2011) Meanwhile, China is usually affected by external shocks, including natural disasters, such as the 2008 Wenchuan Earthquake, and man-made disasters, such as the 2003 outbreak of severe acute respiratory syndrome (SARS). Second, Japan is well prepared for disasters. Disaster management in Japan is carried out at every stage of disaster prevention, disaster emergency response, and recovery and reconstruction following a disaster. A special board of inquiry of the Central Disaster Management Council studies large-scale earthquakes, such as the Tokai, Tonankai, and Nankai Earthquakes, and major earthquakes centered in Tokyo (Kazusa, 2006). Although the Chinese government has been devoting great attention to and resources for risk reduction, and it has also achieved significant results through efforts over decades, many problems persist in the theoretical study and practice of response to natural disasters; its level of disaster emergency management remains inferior to that of developed countries (ADRC, 2005). In addition, compared with developed countries, China's disaster management funds are insufficient (Lixin et al., 2012). Lastly, tourism development in both countries is thriving, but frequently affected by natural disasters, especially earthquakes. Both countries have done little for tourism disaster management. Hence, this study explores tourism disaster preparedness for earthquake-prone countries using Japan and China as case studies.

1.4 Tourism development in Japan and China

1.4.1 Tourism in Japan

The Japanese government has positioned "tourism" as a strategic industry to revitalize the economy of Japan and enhance inter-regional communication, and has been undertaking efforts to promote Japan as a "tourism-based country" (JTA, 2003). According to the 2010 survey report by the Ministry of Land, Infrastructure, Transport and Tourism, the tourism industry contributed significantly to Japan's economy: tourism expenditure reached 23.8 trillion JPY; the spread effect of the industry was 49.4 trillion

JPY, which accounted for 5.5% of the production in national economic counting; and the inducement effect in employment was 424 thousand people (JTA, 2012).

For a better understanding of Japan's tourism, Fig. 1-3 presents a SWOT analysis of the current situation.

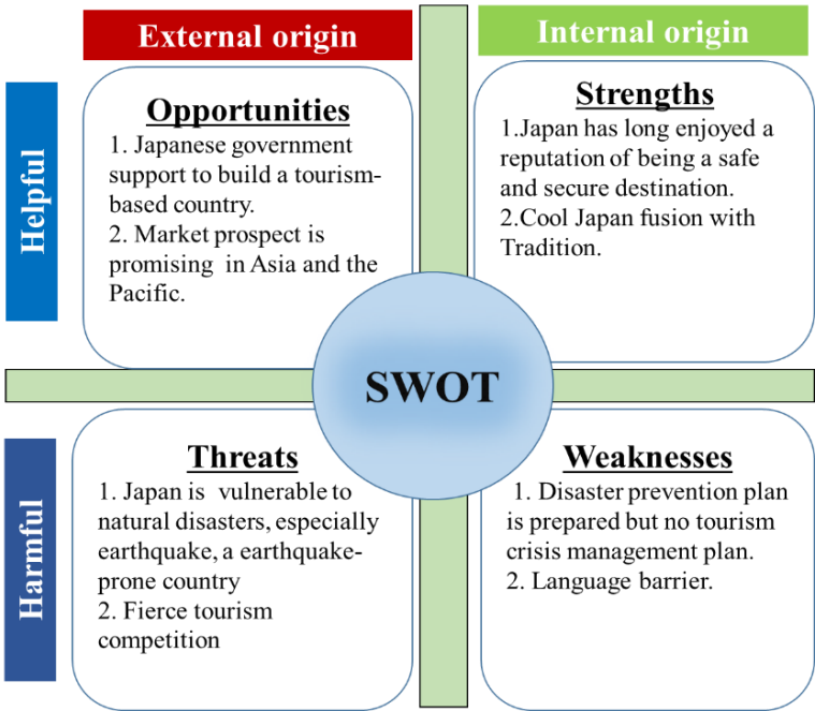


Fig. 1-3 SWOT analysis of Japan tourism industry.

Strengths: Japan has long enjoyed a reputation of being a safe destination, which is Japan's strength, compared with all the competitor destinations in Asia, and brand as a destination. Clean cities, safe streets, a low crime rate, a low risk for communicable diseases, and freedom from concerns for food safety are among Japan's guarantees to its visitors. The quality of products sold at stores in Japan is strictly controlled; fake items are hardly available, if at all. Public transportation is convenient, and drivers are polite; both these aspects help make foreign visitors feel comfortable to get around individually (Takamatsu, 2011). Japan is a country with a dynamic blend of the ancient and modern. Visitors in Japan can enjoy cultural traditions and also visit a number of the world's most technologically advanced cities.

Weaknesses: Disaster prevention planning is advanced in Japan, but a crisis management plan for tourism is currently lacking. However, the Japan Tourism Agency and Okinawa Prefecture has considered conducting a study on tourism crisis management after the Great East Japan Earthquake. Foreign visitors experience a language barrier, especially outside major city centers.

Opportunity: The Japanese government has been striving to promote Japan as a "tourism-based country." As tourism is taken as one of the pillars in the nation's growth strategy, it has been supported and encouraged by the government both at the national and local levels. Other opportunities include the depreciation of the yen against other currencies, which helps lower the cost of traveling in Japan, and new visa policies, such as the easing of visa requirements (e.g., for China) and introduction of visa exemptions (e.g., for Thailand and Malaysia).

Threats: Competition for tourists is fierce in the global market. Japan has suffered many different disasters, especially natural ones, such as earthquakes and tsunamis, because of its geographical location as an island country near major tectonic boundaries. Japan is an earthquake-prone country. The report released by the Japan National Tourism Organization (JNTO; 2012) showed that soon after the Great East Japan Earthquake (Mw 9.0), from March 12 to 31, international visitor arrivals to Japan fell sharply by 72.7% compared with the same period in 2010.

The tourism industry in Japan is promising but also obviously vulnerable to natural disasters. A critical and urgent issue for the tourism industry is to ensure preparedness.

1.4.2 Tourism in China

China has become one of the most famous and popular tourist destinations owing to its vast land with rich tourist resources (including natural sites, historical and cultural sites, and folk customs), positive policy support from the government from the central to the local level, and economic boom. Table 1-1 shows the international ranking of countries by number of international tourist arrivals, as well as the number of tourist arrivals in the last 10 years (the World Bank). According to the forecast by UNWTO (2002), China will become the top international destination country by 2020. In the recent decade, domestic tourism has had a continuous increase of around 10% each year, which now contributes over 4% to the growth of the country's GDP and greatly enhances the employment, consumption, and economic development of China.

Table 1-1 China's international tourist arrivals (Data source: the World Bank)

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ranking	4	4	4	4	4	4	5	4	4	4
Number (million)	33.0	41.8	46.8	49.9	54.7	53.1	50.9	55.7	57.6	57.7

China is also a country that is affected by various disasters, especially earthquakes, floods, and landslides, because of its special location and diverse geographical regions. These disasters endanger life and property. Safety and security are of prime importance

to tourists. Disaster preparedness is also imperative for China.

1.5 Earthquake disasters in Japan and China

1.5.1 Earthquakes in Japan

1.5.1.1 Earthquake distribution in Japan

Japan is located at a point on the Earth's surface where four of more than 10 tectonic plates covering the globe are crushed against each other, making it earthquake prone. More than 20% of the world's earthquakes (Mw 6.0 or greater) have occurred in or around Japan (The Cabinet Office, 2011). Figure 1-4 shows the earthquake distribution around Japan from 1960 to 2011.

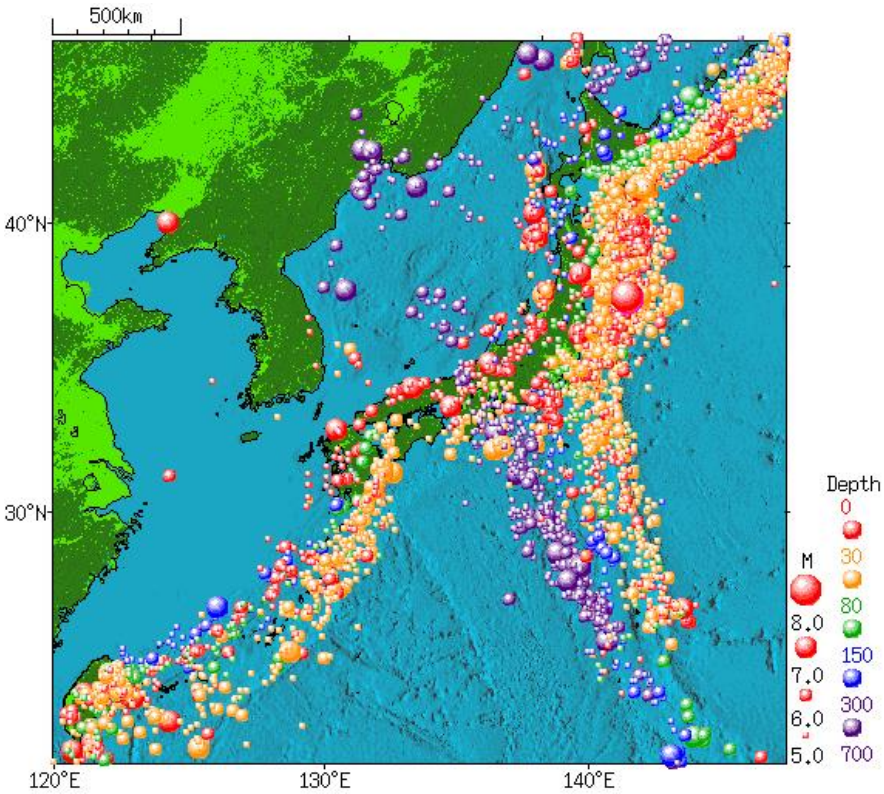
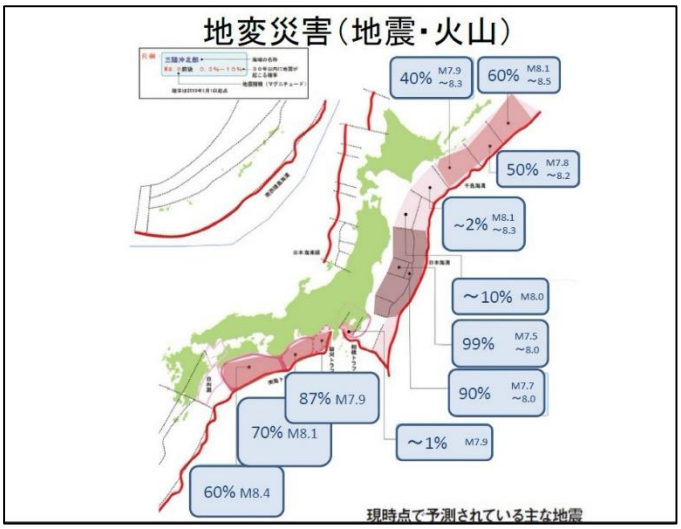


Fig. 1-4 Earthquake distributions around Japan (1960-2011)
(Source: Japan Meteorological Agency (JMA)).

1.5.1.2 Future catastrophes

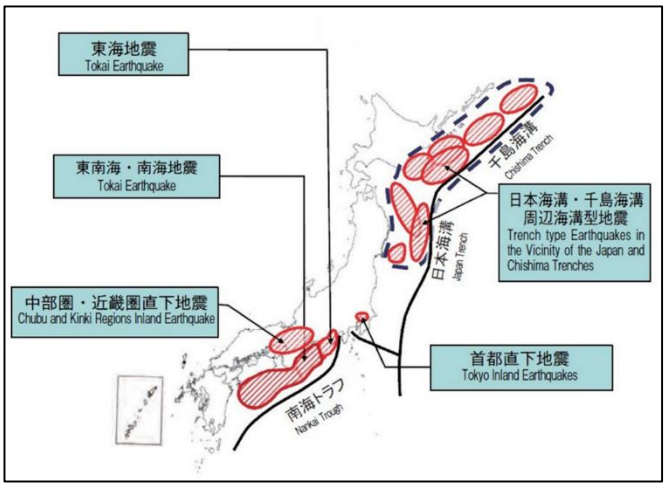
Several earthquake catastrophes are anticipated to occur in the coming decades. Figure 1-5 (a) shows a long-term evaluation of subduction earthquakes within 30 years, released

by the Headquarters for Earthquake Research Promotion in January 2011. In their estimation, Mw 7.5 to 8.0 earthquakes will hit the Miyagi-ken-Oki within 30 years, with a probability of 99%. The Great East Japan Earthquake that struck this area occurred with a magnitude of Mw 8.0. In the event of such earthquakes in the capital area, the impact on tourism would be larger than that of the Great East Japan Earthquake, because the capital region is the center of tourism in Japan. Figure 1-5 (b) indicates the predicted huge earthquakes that will occur in Japan, released by the Cabinet Office in 2011. The so-called Tokyo Inland Earthquake is among the expected catastrophes in the coming decades.



(a) Probability of earthquake occurrence and probable magnitude

(Source: the Headquarters for Earthquake Research Promotion, 2011; Hayashi, 2012)



(b) Main predicted huge earthquakes in Japan (Source: The Cabinet Office, 2011)

Fig. 1-5 Predicted large-scale earthquakes in Japan.

1.5.2 Earthquakes in China

China is a country with high seismic risk owing to its geographic location with seismically active tectonics (See Figure 1-6). In recent years, China experienced several large earthquake disasters, among which the 2008 Wenchuan Earthquake (Mw 8.0) was the most devastating and caused considerable casualty of 69,195 dead, 374,177 injured, and 18,392 missing. The earthquake killed 54 tourists in Sichuan Province, and caused more than 50 billion RMB (7.24 billion USD) in losses to Sichuan's tourism sector as of June 13, 2008 (Xinhuanet, 2008). The 2012 Yunnan Earthquake, with a maximum magnitude of Mw 5.6, left 81 people dead and 821 injured; at least 100,000 people were evacuated and more than 20,000 houses were damaged (Xinhuanet, 2012). China is less prepared for such disasters. At the same time, a lower preparedness level easily causes reputational risk for recovered, already safe tourism destinations and neighboring areas that are not affected by earthquakes. For example, the Jiuzhaigou attractions, which were not physically damaged by the 2008 Wenchuan Earthquake, received almost zero visitors, partly because of security concerns (Sichuan Daily, 2008).

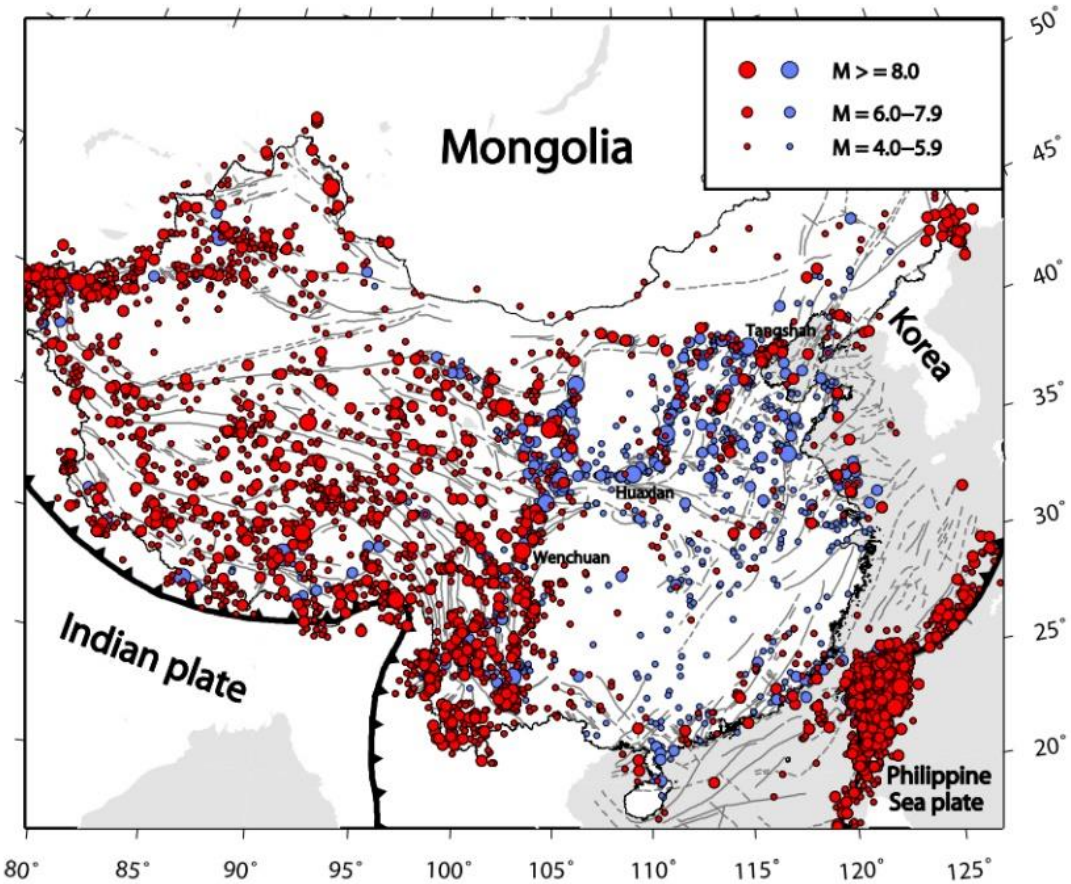


Fig. 1-6 Map of mainland China showing major active faults (thin lines) and seismicity (dots). Blue dots indicate epicenters of historic earthquakes before 1900; red dots indicate earthquakes during 1900–2010 (mostly instrumental records). The barbed lines represent plate boundary faults [after Bird, 2003]. (Source: Wang et al., 2011)

Moreover, earthquake epicenters in China are uneven in spatiotemporal distribution. Assessing earthquake disasters in China is particularly challenging because most of these earthquakes occur along a complex network of faults in the interior of the Eurasian plate (Figure 1-6) (Wang et al. 2011). Therefore, the tourism industry in such a less disaster-prepared country must consider how to prepare for earthquake catastrophes.

1.6 Problem statement

1.6.1 Characteristics of tourism crisis management

1.6.1.1 Uniqueness of the tourism industry

Tourism is an economic and social phenomenon of the modern era. Generally, it has three constitutive characteristics: change of location, temporary stay, and motive or purpose. The tourism product is varied and complex and is often constructed with the cooperation of a number of people and organizations, including hardware and software characteristics (Glaesser, 2006). The tourism industry is characterized by tourist flow (Figure 1-7), high substitutability, labor intensiveness, and seasonality. Figure 1-7 shows transit routes that link tourist-generating regions with tourist destination regions, along with tourist travel direction (Leiper, 1979). The tourism industry is different from other traditional industries, such as manufacturing industry, as shown in Figure 1-8. In traditional manufacturing, workers gather together and produce products, and then the products are transported to the consumer market usually through distributors and retailers. However, for consumers of tourism (tourists or visitors) intending to buy goods (mainly travel experience), they have to move to a tourism destination. The production process simultaneously happens with consumption. The pattern is shown in Figure 1-8.

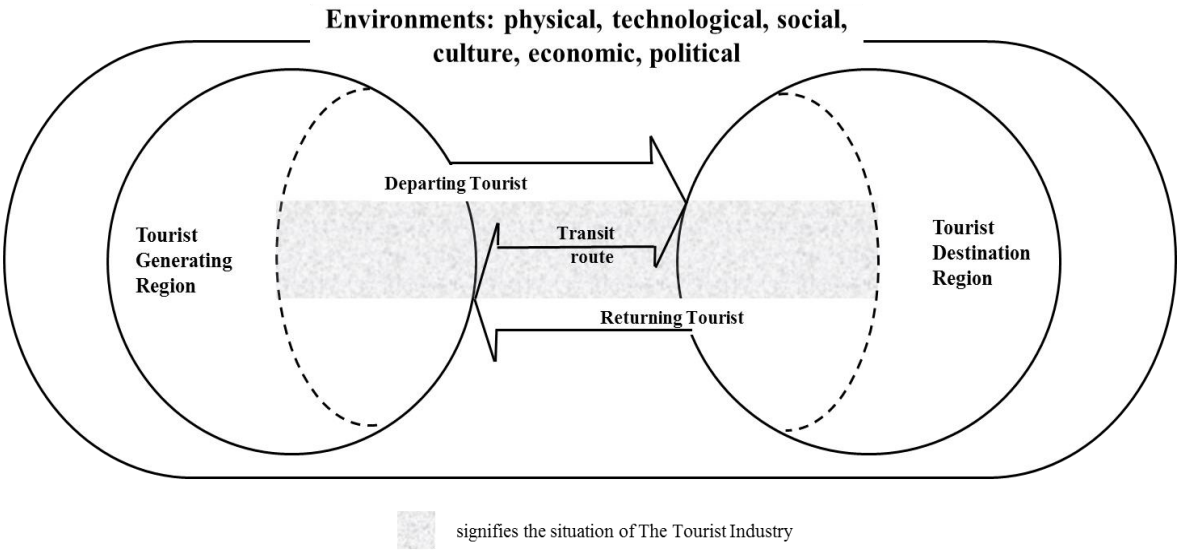


Fig. 1-7 The basic tourism system. (Source: Leiper, 1981:75)

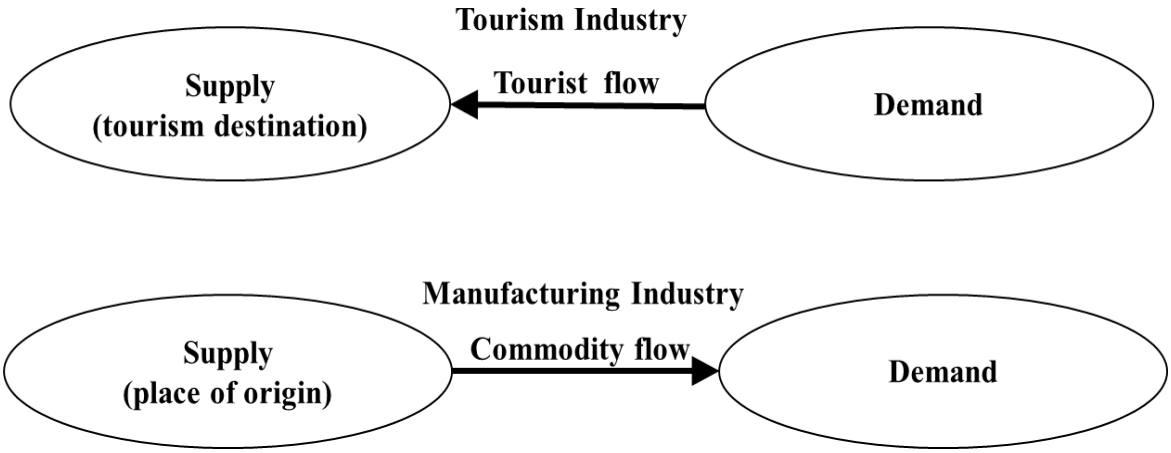


Fig. 1-8 The pattern of tourism industry and manufacturing industry.

1.6.1.2 Uniqueness of tourism crisis management

Tourism crisis management, unlike general crisis management, has its own attributes. Takamatsu (2011) and other researchers discussed disaster prevention planning and tourism crisis management in the disaster response stage. Table 1-2 shows the comparison among them. Local disaster prevention planning mainly aims at protecting local residents who are familiar with the area and their properties by helping them move to safe places, such as shelters. Meanwhile, tourists, especially foreign tourists, are likely unfamiliar with the area they are visiting, and in the event of a disaster, they would not know what to do and where to go to protect themselves. When a large disaster occurs, issues related

to tourists should be considered, such as how to organize them for evacuation and how to support them to return home as soon as possible. Collaboration between the private and public sectors is also important. Identifying missing people in a devastated area would be simple for locals, who are registered in the resident list. In addition, residents would know one another well and could help identify missing people in disasters. However, local residents or disaster prevention divisions would not be able to identify tourists easily in terms of their location and activities; determining which visitors are missing is difficult. For information, booking registrations in accommodations need to be consolidated. Further, private companies and the public sector require close cooperation and collaboration. In the post-disaster tourism recovery stage, to reduce reputation rumor, information sharing and efficient communication are important, especially in the context of the substitutability of tourism destinations.

Table 1-2 Disaster prevention plan and tourism crisis management in emergency response (reference to Burby & Wagner, 1996; Drabek, 1992, 1995; Takamatsu, 2011)

	Crisis Management (disaster prevention plan)	Tourism Crisis Management
Target	**Mainly to protect local residents who are familiar with the area and their properties from disasters.**	**To protect and rescue visitors who are not well aware of the area in the crisis.**
Transfer	**The residents do not need to leave the region after the crisis if the local community is not destroyed.**	**To support visitors to return home safely or send visitors home.**
Cooperation	**The formation of team of various public agencies and organization to cope with the hazard as well as the location of the public facilities that are to be used for shelters.**	**Cooperation and collaboration between private companies and public sector are necessary, e.g. who is lost in the crisis.**

1.6.2 Applicability of a general comprehensive framework for the tourism industry

Although relevant results have been achieved in tourism crisis management, available models are similar to general disaster management models because they mostly consider only local residents and properties, and seldom discuss tourists. The models proposed by Faulkner (2001) and Ritchie (2004) are widely recognized but still lack consideration of tourists; these models describe six seemingly perfect stages: pre-event stage, prodromal, emergency, intermediate, long-term recovery, and resolution. In addition, few studies have suggested approaches to the formulation of a specific strategy, such as earthquake

disasters. Orchiston (2010), in a study on seismic risk perceptions and preparedness of tourism business managers in New Zealand, found that business preparedness and resilience from earthquake disasters need improvement.

As disasters also have unique characteristics, general tourism disaster management planning, to a certain extent, can be used as a common reference, but it cannot be successfully applied to all disasters. For example, forecasting for earthquakes, unlike storms and flooding, is difficult. When earthquakes occur, the pre-event and prodromal stages seem non-existent.

Tourism destinations also have their own local conditions. For instance, Japan is well prepared in disaster management from the central to the local government, and has long been famous as safe tourism destination. Meanwhile, China, a developing country, is less prepared and is frequently struck by external events. Therefore, the same framework or plan would not be practicable to these two countries.

Accordingly, regional situations and disaster characteristics should be taken into consideration. The above discussion is summarized into the following problems.

(1) General crisis management is not suitable or sufficient for tourism.

Numerous studies have described general crisis management. However, these studies seldom include tourists and their welfare when devastating disasters occur. Thus, it is infeasible to apply general crisis management to the tourism industry.

(2) Few research has focused on the impact of huge earthquakes on tourism demand in the two earthquake-prone countries of Japan and China.

The few studies on earthquakes' impact on tourism demand (Mazzocchi and Montini, 2001; Huang and Min, 2012) apply the forecast method. However, research on this field is lacking after the 2008 Wenchuan Earthquake in China and the 2011 Great East Japan Earthquake. It remains unknown whether these large-scale earthquakes are the main disasters that most significantly impacted tourism demand, compared with other disasters, because there is also no such comparison of all kinds of disasters' impact on tourism demand in previous literature.

(3) A practicable strategy to cope with seismic risk on the basis of tourism characteristics is unavailable.

The existing frameworks for tourism disaster management, similar to general disaster management, usually decompose disasters into several stages to address. These frameworks contribute to general pre-disaster planning to reduce damage beforehand. However, different disasters and nations have their own natural conditions and situation, and consequently, specific cases need to be taken into consideration in proposing strategies to prepare for large-scale earthquakes.

1.7 Research objectives and structure

1.7.1 Research objectives

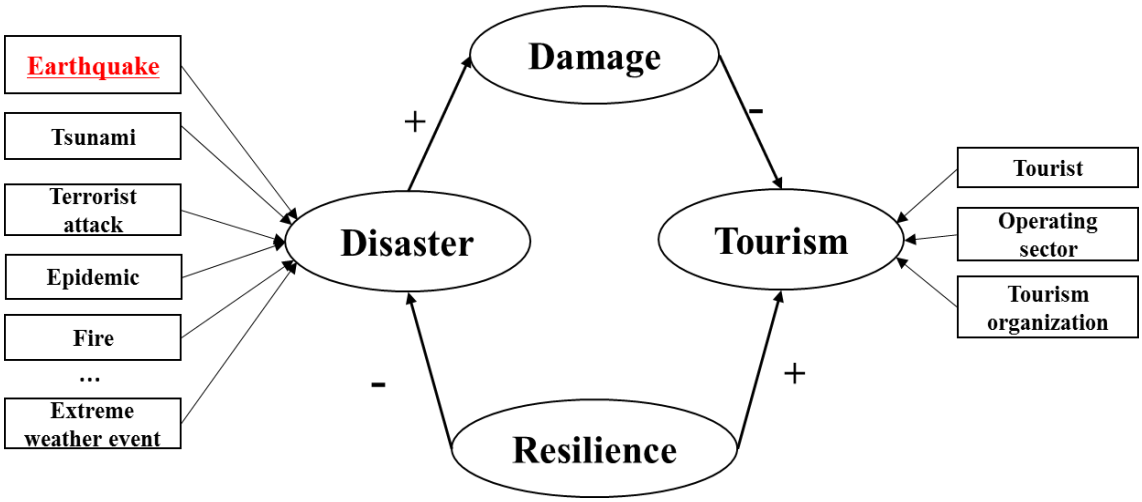


Fig. 1-9 Conceptual framework of this study.

Figure 1-9 illustrates the conceptual framework of this study. This research aims to improve resilience of tourism industry, as in a society with high resilience, disasters would cause less damage, and businesses could better withstand disasters. Many types of disasters occur, as Faulkner (2001) noted that we live in an increasingly disaster-prone world. These events may impact tourism, which mainly consists of the tourist, operating sectors, and tourism organizations. Hayashi (2003; 2009) developed a crisis management model shown in Figure 1-10. The model sheds light on the impact of disasters and introduces two methods to reduce disaster damage from human factors and natural causes. As earthquakes, unlike weather-related disasters, cannot be forecasted, this study will concentrate on the issue of earthquake disaster preparedness in disaster-prone countries. The tourism industry should consider ways to prepare for them to reduce damage and recover quickly; that is, to improve resilience. Hayashi et al. (2009) also developed a model to explain the concept of resilience (Figure 1-11). According to the model, once a disaster occurs, vulnerability can be minimized by reducing damage and shortening recovery time; thus, it provides means to improve the resilience of society. Along with the problems mentioned above, this study aims to answer the following questions: how to explore the impact of large-scale earthquakes on tourism demand, and how to prepare for large-scale earthquake disasters. The first issue is divided into two objectives, namely, impact on tourism demand and comparison of disasters in terms of their impact on tourism demand. The second goal is to explore earthquake preparedness strategies from the

perspective of tourism demand and tourism supply.

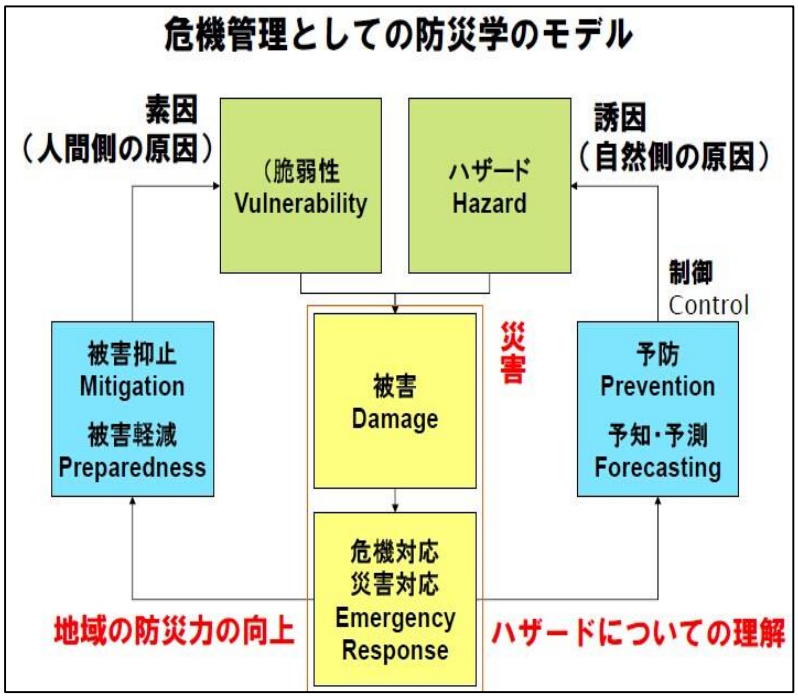


Fig. 1-10 Crisis management model. (Source: Hayashi, 2003; 2009)

Specifically, the research objectives are described as follows:

1.7.1.1 To test the impact of large-scale earthquakes on tourism demand

This objective aims to shed light on the impact of large-scale earthquake disasters on tourism demand. The ARIMA model with dummy variables is applied to develop the recovery pattern of tourist arrival marketing using case studies of Japan after the Great East Japan Earthquake and Sichuan, China, after the 2008 Wenchuan Earthquake.

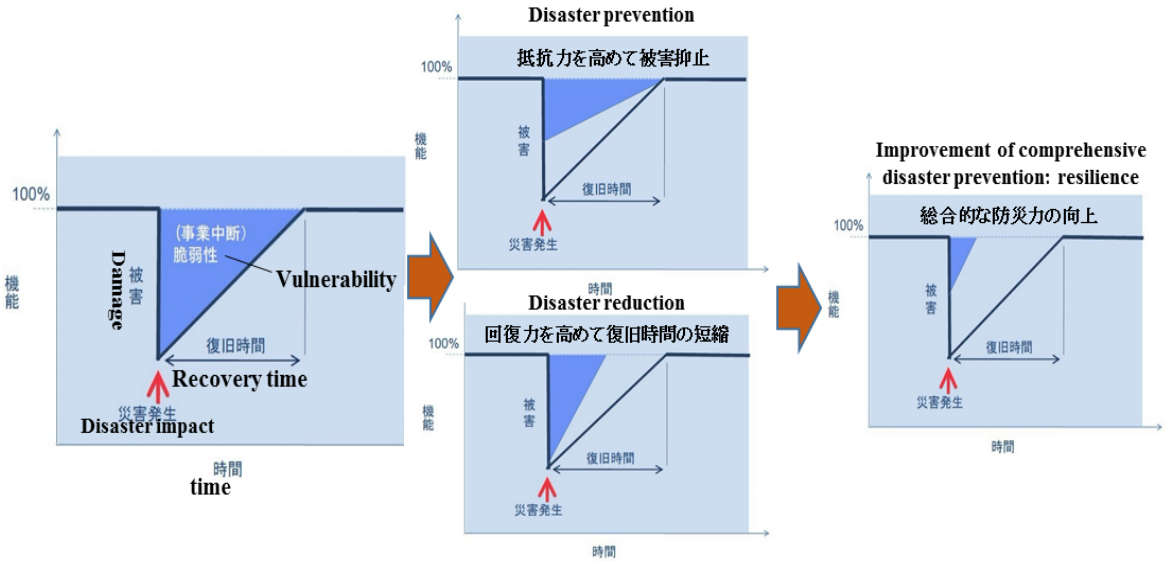


Fig. 1-11 Improvement of comprehensive risk reduction: resilience. (Source: Kyoto University/NTT Resilience Joint Research Group, 2009)

1.7.1.2 To identify the primary type of disasters that most significantly impact tourism demand

As no study has explored the impact patterns of disasters on tourism and then compared the main disasters that impact tourism demand, this work attempts to explore this issue on the basis of the hypotheses that not all disasters significantly impact tourism demand and huge earthquakes most dramatically impact tourism demand; a case study of Japan illustrates these points. In this section, intervention analysis is applied.

1.7.1.3 To investigate tourist perception and attitude toward post-earthquake tourism destinations

The tourist is the core of the entire tourism system. As such, the third objective is to investigate tourist perception after large earthquakes from the perspective of tourism demand. Currently, theoretical studies on and practical reactions to natural disasters are problematic in China (ADRC, 2005). Under these circumstances, the likely outcome is that destinations face reputation risk; that is, even after the affected regions have become safe, tourists would still be afraid to come for the sake of safety. This section takes Sichuan in China as the case study region to explore tourists' reasons to visit and the characteristics of such sites that draw tourists by applying face-to-face structural interviews conducted among those visitors in Chengdu and Dujiangyan. Apart from descriptive analysis, structural equation modeling (SEM) is used to analyze data collected through a questionnaire survey.

1.7.1.4 To examine the level of earthquake preparedness in high seismic risk regions

The fourth objective is to investigate the level of earthquake preparedness based on a case study of Japan from the perspective of tourism supply. Qualitative interviews with managers of tourism organizations and postal survey to managers of tourism sectors are conducted. In this regard, the goal is to explore the relationship between risk perception and earthquake preparedness by applying SEM.

1.7.2 Research hypothesis

Figure 1-12 describes the hypothetical model that examines three main constructs and their relationship. Each hypothesis is crafted on the basis of the literature review. Details on the literature are presented in the literature review section of chapter 2. The research hypotheses are as follows:

H_1: Huge earthquakes have significant and negative effects on tourism demand.

H_2: Compared with other disasters, huge earthquakes most significantly impact tourism demand.

H_3: Attitude toward earthquakes' impact on tourism in Sichuan (AEITS) is affected

by risk perception and travel motivation, both of which affect tourist satisfaction (from the tourism demand side).

H_{3a}: Tourist risk perception is correlated with travel motivation.

H_{3b}: Risk perception positively affects AEITS.

H_{3c}: Risk perception negatively impacts tourist satisfaction.

H_{3d}: AEITS is negatively impacted by travel motivation.

H_{3e}: Travel motivation positively affects tourist satisfaction.

H_{3f}: AEITS negatively affects tourist satisfaction.

H4: Tourism sectors and tourism organizations are less prepared for the earthquakes predicted to strike in future, and earthquake preparedness level is affected by a manager's risk perception, threat knowledge, and current disaster preparedness (from the tourism supply side).

H_{4a}: The threat knowledge of managers in tourism sectors has a positive and significant impact on risk perception.

H_{4b}: Risk perception positively affects disaster preparedness.

H_{4c}: A higher risk perception helps promote earthquake preparedness.

H_{4d}: A comprehensive knowledge of threat promotes a higher level of disaster preparedness.

H_{4e}: Disaster preparedness positively impacts earthquake preparedness.

H_{4f}: Earthquake preparedness is positively affected by a manager's threat knowledge.

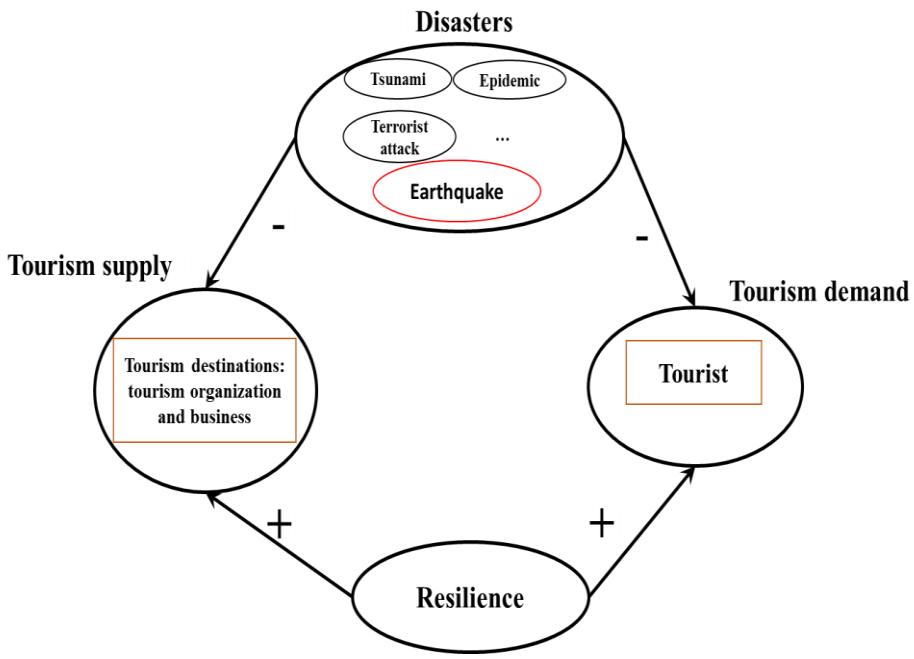


Fig. 1-12 Hypothetical model of this study.

1.7.3 Research structure

This study is composed of seven chapters. Chapter 1 gives an overview of the study, including background, research objective and structure, and current problems in this field. Chapter 2 reviews the literature on tourism and disasters, introduces the developments in tourism management against huge earthquakes, and then summarizes the problems in earthquake preparedness for the tourism industry. Chapter 3 tests the sensitivity of the tourism demand to huge earthquakes to shape a better understanding of the impact of huge earthquakes on tourism demand. Chapter 4 examines the impact of all disasters on tourism to determine whether huge earthquakes have the most impact on tourism demand. Chapter 5 investigates tourist risk perception and attitudes toward disasters in post-earthquake regions from the perspective of tourism demand to identify the main factors that affect tourist travel. Chapter 6 examines the earthquake preparedness level in high seismic risk areas, and explores the main factors that impact earthquake preparedness from the perspective of tourism supply. Chapter 7 summarizes the main findings and then discusses propositions. The contents of each chapter is described as follows.

1.7.3.1 Chapter 1: Introduction

This chapter describes the background, problems, objectives, and structure of this study. Tourism is promising but is vulnerable to external shocks, such as huge earthquakes. Japan and China are representative countries either in disaster management or national conditions, and as such, they are taken as cases in this study. Unlike other industries, tourism is characterized by tourist movement; tourists are usually unfamiliar with the destinations they visit. Another problem is that reputation risk frequently happens. Thus, special earthquake preparedness for tourism is necessary.

1.7.3.2 Chapter 2: Literature review

Chapter 2 reviews the main literature concerning tourism and disasters. Although limited, studies in the field have been increasingly conducted in the past decades, especially since the 9/11 terrorist attacks in 2001. The current topics in this field focused on two issues, namely, the impact of disasters on tourism demand and development of tourism crisis management models. The first issue relates to the comparison of research objects and methods. The second one explores the main points in previous tourism crisis management studies.

1.7.3.3 Chapter 3: Sensitivity of tourism demand to huge earthquakes

In this chapter, ARIMA analysis with dummy variables is applied to test the sensitivity of tourism demand to huge earthquakes based on the case studies of Sichuan in China after the 2008 Wenchuan Earthquake and Japan after the 2011 Great East Japan Earthquake. Recovery progress and time are obtained.

1.7.3.4 Chapter 4: Impact of disasters on tourism demand

Chapter 4 examines the impact of disasters on tourism demand using intervention analysis using a case study of Japan to check if large-scale earthquakes most negatively and significantly impact tourism demand, with the aim of shedding light on the impact of such earthquakes conducted in chapter 3, by comparing the impacts of disasters.

1.7.3.5 Chapter 5: Analysis of tourist perception and attitudes toward disasters: Case study of recent large earthquake disasters in China

The perspective in this chapter is from the demand side of tourism to explore tourist motivation and the characteristics of affected sites that draw tourists, focused on the 2008 Wenchuan Earthquake and 2013 Ya'an Earthquake, by conducting face-to-face structural interviews with visitors in Chengdu and Dujiangyan. SEM is used to explore the interrelationship among four constructs based on the literature review.

1.7.3.6 Chapter 6: Tourism sector preparedness in zones with high seismic risk: Case study on the National Capital Region of Japan

In this chapter, qualitative interviews are conducted with the persons in charge of tourism organizations in the Awaji, Kobe, Tokyo, and Tohoku regions to determine the disaster preparedness of the local tourism industry, particularly in coping with disasters, mainly earthquakes. Based on the results of the interviews with selected tourism sectors, field and postal surveys are conducted in the high seismic area of the National Capital Region of Japan. SEM is also employed to explore the surveyed constructs to ascertain the main factors that impact earthquake preparedness.

1.7.3.7 Chapter 7: Discussion

The discussion section summarizes the main findings and provides propositions for China, as well as countries with similar needs, from the perspective of tourism demand. The results are also presented, and the strategies for improving the earthquake preparedness of the capital region of Japan, which faces a high seismic risk, are discussed from the perspective of tourism supply. Subsequent steps are likewise discussed in this chapter.

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Chapter 2 Literature review

Faulkner (2001) noted that we are living in an increasingly disaster-prone world. In the last couple of decades, in view of recent crises that affected the tourism industry, from the Chi-chi Earthquake in 1999, 9/11 terrorist attacks in 2001, outbreak of foot and mouth diseases in 2001, SARS epidemic in 2003, Indian Ocean tsunami in 2004, and Lehman shock in 2008, interest in discussing the impact of actual and potential threats has considerably increased. Likewise, interest in crisis management for the tourism industry has grown. However, there is still a lack of such research on crises or disaster phenomena in the tourism industry, on the impact of such events on both the industry and specific organizations, and the responses of the tourism industry to such incidents (Faulkner, 2001; Ritchie, 2004; Maditinos and Vassiliadis, 2008).

2.1 Impact of disasters on tourism

The current literature concerning the impact of disasters on tourism can be divided into two correlative aspects: impact on tourism demand (e.g., domestic and international visitors, including inbound and outbound visitors), and impact on tourism supply (e.g., tourism destination as a whole, tourism authorities, and tourism enterprises, such as hotels and travel agencies) (Wu and Hayashi, 2013). Since the 2001 terrorist attacks, the literature on crises or disasters in the tourism industry has increased significantly. However, research on crises or disaster phenomena in the tourism industry remains limited (Faulkner, 2001).

2.1.1 Impact on tourism demand

Previous studies have discussed that tourism demand is affected by many kinds of disasters, including earthquakes (Mazzocchi and Montini, 2001; Huang and Min, 2012; Yang et al., 2008), terrorist attacks (Pizam and Fleischer, 2002; Ito and Lee, 2005; Araña and León, 2008), infectious diseases (Kuo et al., 2008; Pine and McKercher, 2004), financial crises (Wang , 2009; Page et al., 2011), and tsunamis (Birkland et al., 2004; Carlsen and Hughes, 2008).

Mazzocchi and Montini (2001) explored the impact of the earthquake that hit the Umbria region in Central Italy on September 26, 1997 on tourist flows. Huang and Min (2012) investigated the impact of the September 21 Earthquake (Mw 7.3) on inbound tourist flows in Taiwan and found that the inbound tourism demand had not rebounded

after the 11th month since the earthquake. Yang et al. (2008) discussed the effects of the 2008 Wenchuan Earthquake (Mw 8.0) on tourism in Sichuan, China. Orchiston (2010) studied the physical outcomes of a large Alpine Fault earthquake on the tourism industry in New Zealand, and the results showed that post-disaster recovery in terms of visitation can be predicted to take approximately 12 to 18 months, depending on the timing of the earthquake. Birkland et al. (2004) explored the effects of the December 26, 2004 Indian Ocean tsunami on tourism in Thailand, in which a much higher proportion of the tsunami victims were tourists than in other affected nations. Carlsen and Hughes (2008) examined the rates of recovery of ten source markets for the Maldives in the wake of the 2004 Indian Ocean tsunami. Bigano et al. (2005) estimated the impact of weather extremes on tourism and other key economic sectors using econometric models and national statistics data that cover all regions in Italy for the last three decades. Kuo et al. (2008) assessed the impacts of infectious diseases, including avian flu and SARS, on international tourist arrivals to Asian countries using both single datasets and panel data procedures. Pine and McKercher (2004) identified major impacts of SARS events on tourism in Hong Kong, including tourist arrivals in hotels, and airlines. Wang (2009) examined the impact of various disasters, including the Asian financial crisis in 1997, 921 Earthquake in 1999, September 11 terrorist attacks in the United States in 2001, and outbreak of SARS in 2003, on inbound tourism demand in Taiwan and found that the number of inbound tourists suffered the greatest decline during the outbreak of SARS, followed by the 921 Earthquake, whereas tourism arrival decline during the September 11 terrorist attacks and Asian financial crisis was relatively mild; Wang concluded that any impact on safety, whether domestic or international, negatively affects tourism demand.

Several methods are available in assessing the impact of disasters on tourism flows, such as the Chow test (Chow, 1960), intervention or interrupted time series analysis (Box and Tiao, 1975; McCain and McCleary, 1979), and forecasting based on models (e.g., Mazzocchi and Montini, 2001; Huang and Min, 2002; Mendoza et al., 2012).

Previous studies relevant to this field mostly applied forecasting to examine the impact of disasters on tourism demand by investigating the differences between estimated and actual values. The method mentioned above mainly consists of two types: one is based on econometric approaches (e.g., Wang, 2009) and the other on time series forecasting (e.g., Huang and Min, 2002). In time series forecasting, models are used to predict future values based on previously observed data.

Econometric approaches often apply models to test the relationship between a dependent variable and one or more independent variable changes. The studies that applied econometric models mostly discussed the relationship between tourism demand and macroeconomic variables. Lim (1997) indicated that the most popular explanatory

variables used in tourism demand models are income, relative prices, and transportation costs, by reviewing published studies. Lim (1999) collected the major empirical studies on the relationship between international tourism demand and macroeconomic variables (income, transportation costs, and tourism prices). In these studies, disasters were set as dummy variables, a type of explanatory variable. Witt and Martin (1987) found that economic theory does not give a clear indication of the factors likely to be operative for a particular origin–destination holiday visit data set.

Time series analysis often generates acceptable forecasts at low cost with reasonable benefits in testing the accuracy of different forecasting models for tourist arrivals (Chu, 2008). A number of studies have related the impact of disasters on tourism demand by applying time series analysis. For example, Mazzocchi and Montini (2001) evaluated the statistical relevance of the earthquake that struck the Umbria region in Central Italy on September 26, 1997, using monthly time series data of tourist arrivals and stays. Huang and Min (2002) established a seasonal ARIMA model based on monthly inbound visitor arrival data before the 921 earthquake (M 7.3) to forecast the inbound visitor arrivals after it (September 1999 to July 2000), then compared the forecast volume and actual values. They concluded that up to the 11th month after the earthquake, inbound tourism demand had not rebounded completely. Mendoza et al. (2012) also focused on monthly visitor arrivals to measure the impact of the earthquakes in Chile (in the north, south, and center parts of Chile on April 21, 2007 [Mw 6.2], November 14, 2007 [Mw 7.7], and February 2010 [Mw 8.8], respectively) by seasonal ARIMA analysis; the results indicated that the impacts depended on the magnitude of the earthquake and perception of safety. Kuo et al. (2008) estimated the impacts of the avian flu and SARS outbreak on international tourist arrivals in Asian countries using the autoregressive moving average model with exogenous variables (ARMAX) model. McAleer et al. (2010) also evaluated the impact of SARS and the avian flu on international tourist arrivals to Asia, utilizing static line fixed-effect and difference transformation dynamic models.

The works using time series analysis mostly chose to apply ARIMA analysis, which usually outperforms other forecasting approaches in forecasting tourism demand (Lin et al., 2011; Lim and McAleer, 2002; Gonzalez and Moral, 1995). However, one problem using these models for forecasting tourism demand is that previous disasters that had affected tourism demand of the time were not considered, despite their potential impact on the accuracy of current forecasting. Therefore, in the present study, to improve forecasting accuracy, one-off events will be included in the ARIMA analysis through the use of dummy variables. A Box-Jenkins ARIMA model incorporating dummy variables is established to measure the impact on tourism demand, in the cases of Japan and China.

Further, all studies on the impact of disasters on tourism demand only concern one or

several disasters. There is almost no such research trying to explore the patterns of the impacts of all disasters, assess the impacts, and then compare them. A comprehensive understanding of the impact of disasters on tourism demand needs to be formed. Hence, this study will attempt to conduct such examination and comparison using ARIMA-intervention analysis, which can be regarded as an extension of ARIMA modeling. The main focus is on estimating change patterns by observing the variation in parameters.

Intervention analysis is widely and successfully used to examine the impact of a single certain disaster on tourism demand. For instance, Lee et al. (2005) applied this technique to assess the impact and recovery pattern of the US air transport passenger demand after the September 11 terrorist attacks. Their results indicated that the terrorist attacks had a short-term but significant impact on air transport passenger demand. A similar methodology was applied by Hultkrantz and Olsson (1997) to measure the impact of the Chernobyl nuclear accident on domestic and international tourism in Sweden. Coshall (2003) employed intervention analysis to analyze the impact of three effects on flows of UK air passengers to a variety of destinations. Intervention analysis was also used to evaluate the impact of the 921 Earthquake in 1999 and SARS outbreak in 2003 on Taiwan's inbound tourism by Min (2008), who found that of the two events, the SARS epidemic influenced inbound tourism more heavily. The impact of SARS in 2003 on inbound tourism from Japan to Taiwan was examined by Min et al. (2011) using intervention analysis. Therefore, the current study will also apply ARIMA-intervention analysis to examine the impact of disasters on inbound tourist arrivals by a case study of Japan. The goal is to illuminate the impact of damaging earthquakes on tourism demand.

2.1.2 Main topics

A survey was conducted to collect literature by entering such keywords as "tourism, disaster," "tourism, crisis," or "tourism, earthquake," in the input bar of Google Scholar. As of February 14, 2013, 157 papers were collected. Among them, the most popular topic was disaster (44 papers), which was followed by crisis (42 papers), terrorism (24 papers), and infectious diseases (19 papers) (See Figure 2.1). Based on the issues discussed in the papers related to crises and disasters, no clear distinction was found between "crisis" and "disaster." Faulkner (2001) compared crises and disasters, and defined that a crisis is internally generated or induced by actions or inactions of self-organizations, whereas a disaster is induced by natural phenomena or outside the realm of human action. The most popular specific single event was terrorism (24 papers) followed by tsunami (13 papers), SARS (10 papers), and foot and mouth disease (7 papers). Among the surveyed papers, only four used earthquakes as theme.

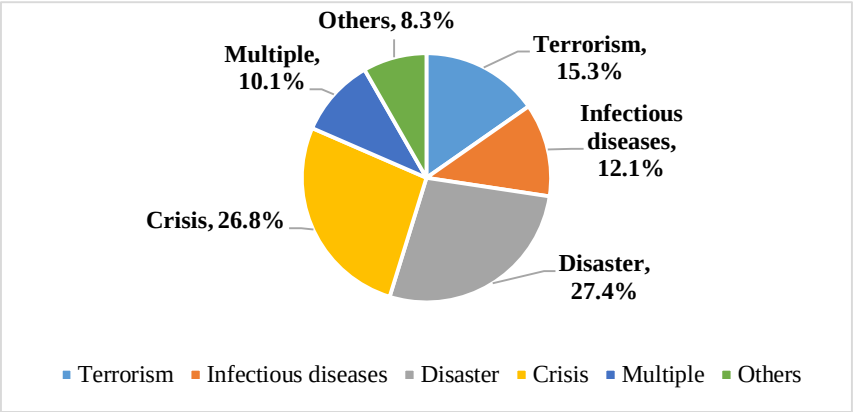

Fig. 2-1 The ratio of the papers according to the types of events.

2.2 Tourism disaster management

2.2.1 Disaster management model

Hayashi (2003) developed a general crisis management model (Figure 2-2) that could minimize damage by disasters (disaster mitigation) and provide effective support for disaster response (disaster preparedness). The model describes the two main aspects that cause disaster, including hazard induced by natural factors and vulnerability related to human causations. Risk reduction strategies are also mentioned in this model, namely, understanding a hazard (disaster prevention and forecasting) and improving disaster resilience (disaster mitigation and preparedness). The model adopts a circular-flow diagram that requires stakeholders to learn lessons from past disasters. This model promotes a better understanding of the process, from disaster occurrence to response and recovery.

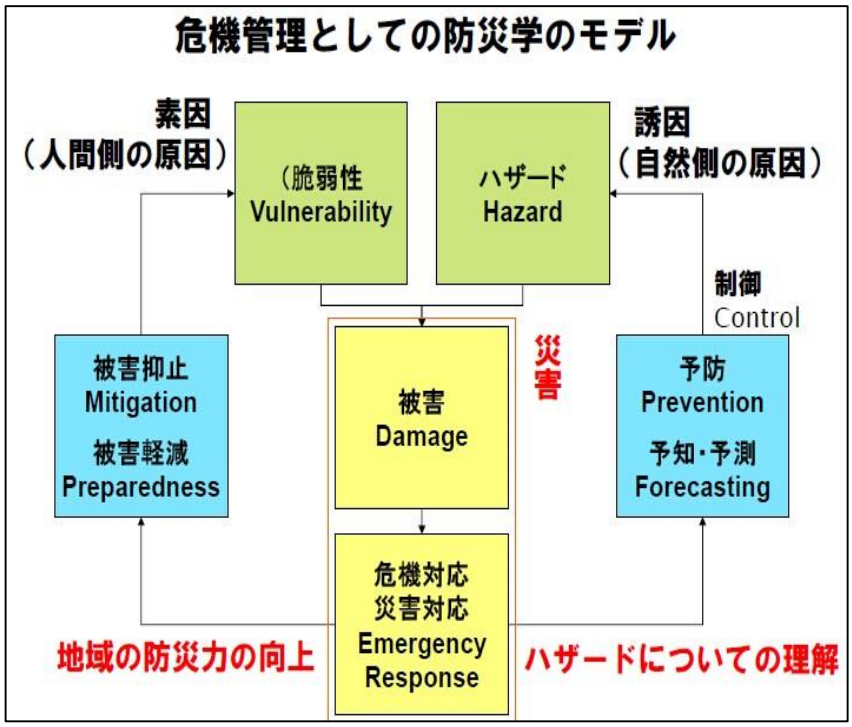

Fig. 2-2 Crisis management model. (Hayashi, 2003)

The four phases of disaster management, namely, prevention, mitigation, response, and recovery, have been diffusely applied in developing disaster response plans. Hayashi (2002) also proposed a disaster management cycle (see Figure 2-3).

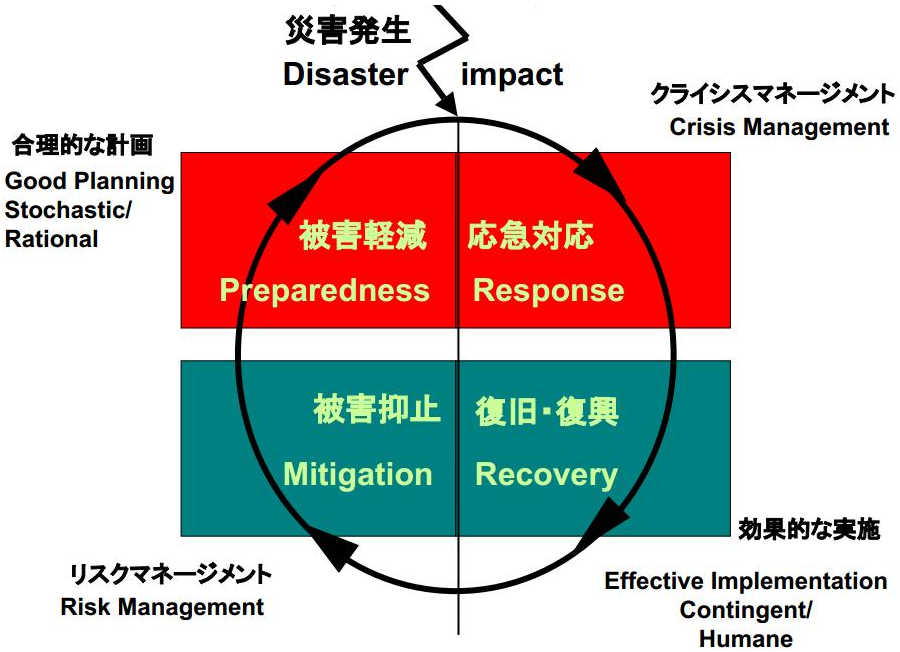

Fig. 2-3 Disaster Management Cycle. (Source: Hayashi, 2002; 2006)

The disaster management cycle describes the process through which emergency managers prepare for emergencies and disasters, respond to them when they occur, help people and institutions recover from them, mitigate their effects, reduce the risk of loss, and prevent related disasters, such as fires, from occurring. Each of the disaster management phases must be considered. Integrating all emergency management activities, throughout all phases of an emergency, and across all functions, increases accountability, provides continuity of resource application, establishes a clear chain of command and coordination, and identifies responsibilities for critical task performance.

2.2.2 Tourism disaster management framework

Many researchers have proposed specific strategies for the tourism industry (Gonzalez-Herrero and Pratt, 1997; Fall, 2004; Ritchie, 2004; Williams and Ferguson, 2005; Carlsen, 2006; Scott et al. 2008), and most of them focus on exploring frameworks or models for tourism disaster or crisis management (Arbel and Bargur, 1980; Cassedy, 1991; Young and Montgomery, 1998; Faulkner, 2001; Henderson, 2003; Presenza et al., 2005; Paraskevas and Arendell, 2007; Hystad and Keller, 2008; Racherla and Hu, 2009; Au and Ali, 2010; Tsai and Chen, 2011). Nonetheless, studies on tourism disaster management are still lacking (Faulkner, 200; Ritchie, 2004). More recent research on tourism crisis management argues for a more proactive and strategic approach to crises and disasters (Faulkner, 2001; Ritchie, 2004; Paraskevas and Arendell, 2007).

The models proposed by Faulkner (2001) and Ritchie (2004) are widely recognized. Existing studies mostly aim at minimizing damages and loss in the tourism industry. On the basis of the research of general disaster management by Fink (1986) and Roberts (1994), Faulkner (2001) developed a comprehensive disaster management framework for tourism (Table 2-1). In the framework, the disaster process includes six stages: pre-event, prodromal, emergency, intermediate, long-term recovery, and resolution. This model is similar to that for general disaster management, which emphasizes the local residents and properties, and fails to mention tourists. Based on a comparison of the crisis and disaster lifecycles in Faulkner (2001), Fink (1986), and Roberts (1994), Ritchie (2004) proposed a disaster management framework (shown in Figure 2-4), which is similar to Faulkner's (2001) and includes six stages of disaster process. The framework mainly consists of proactive planning, strategic implementation and resolution, and evaluation and feedback. Compared with Faulkner's framework (2001), Ritchie's framework mentions a number of strategies, such as communication strategies and collaboration between stakeholders. The current disaster management models or frameworks in use mainly derive from Faulkner's (2001) and Ritchie's (2004). These frameworks were developed based on the traditional ones, including the four main stages in chronological order, namely, pre-

disaster preparedness, emergency response, recovery, and mitigation. Both Faulkner's (2001) framework and Ritchie's (2004) model include the prodromal stage, in which a disaster is apparently imminent. However, not all disasters can be forecasted in advance, and an earthquake is a typical example.

Although the cooperation among sectors and organizations mentioned above is critical, Mistilis and Sheldon (2006) indicated that it is more important to identify the uniqueness of tourism from a disaster planning perspective and then recognize that tourism is exposed to more danger compared with other industries, because tourism is highly people oriented with both employees and tourists being vulnerable to disasters. At the same time, tourists may have a language barrier and may not be aware of the means to keep safe when a disaster hits a tourism destination.

2.2.3 Main indicators

Previous studies have discussed strategies for tourism disaster management. From the perspective of tourism demand, several indicators have been put forth, such as perception of natural disasters (Park and Reisinger, 2010), travel motivation (Rittichainuwat, 2008; Yoon and Uysal, 2005), attitude factors (Gnoth, 1997; Hsu et al., 2010; Dunn, Ross, and Iso-Ahola, 1991), and satisfaction (Gan et al., 2010; Li et al., 2011). On the part of tourism supply, risk perception (Finnis, 2005; Meheux and Parker, 2006, Orchiston, 2010), threat knowledge (Finnis, 2005; Hystad et al., 2008; Orchiston, 2010), disaster preparedness (Finnis, 2005; Hystad et al., 2008, Orchiston, 2010), earthquake preparedness (Orchiston, 2010), perceived resilience (Orchiston, 2010), and risk communication (Meheux and Parker, 2006; Orchiston, 2010) have been considered.

In empirical analyses, a frequent requirement is to explore the relationship among variables. Regression analysis and SEM can usually achieve this prerequisite. SEM is a technique for specifying, estimating, and evaluating models of linear relationships among a set of observed variables in terms of a generally smaller number of unobserved variables (Shah and Goldstein, 2006). SEM has been widely applied in management and the social sciences, including tourism sciences, as it can represent causal relationships among variables. Compared with traditional multivariate regression models, structural equations are simultaneous equations models, in which variables may influence one another reciprocally (Song and Li, 2008). Robin and Haywantee (2011) summarized the considerable advantages of SEM over regression analysis into four categories: (1) modeling of measurement errors and unexplained variances, (2) simultaneous testing of relationships, (3) ability to link micro and macro perspectives, and (4) support for best-fitting model and theory development. As the current study will explore a set of linear relationships among observed and unobserved variables, SEM is more suitable.

Fig. 2-4 Crisis and disaster management: a strategic and holistic framework. (Ritchie, 2004)

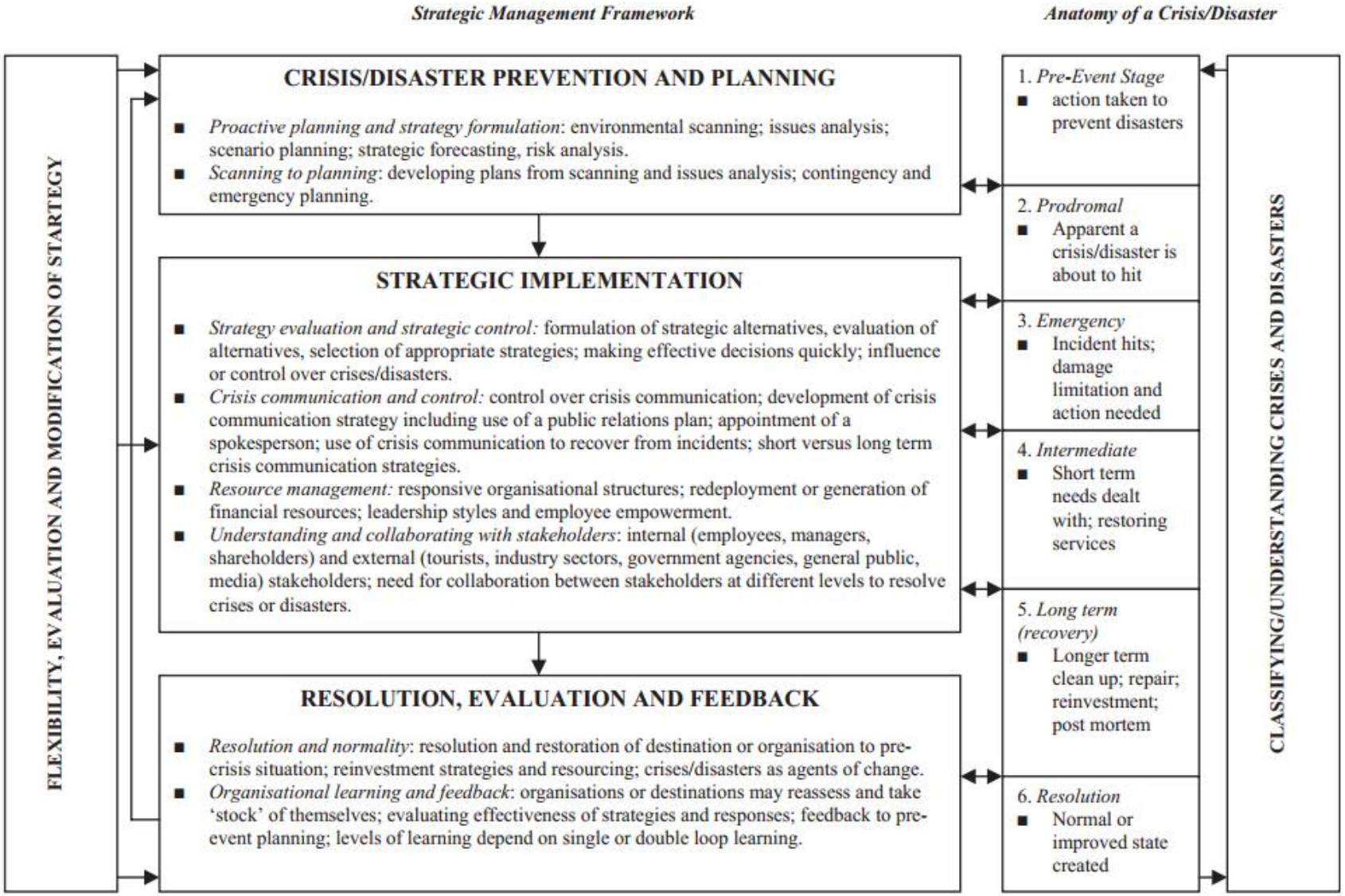

Table 2-1 Tourism disaster management framework (Source: Faulkner, 2001)

Phase in disaster process	Elements of the disaster management responses	Principal ingredients of the disaster management strategies
1. *Pre-event* When action can be taken to prevent or mitigate the effects of potential disasters	*Precursors* • Appoint a disaster management team (DMT) leader and establish DMT • Identify relevant public/private sector agencies/organisations • Establish coordination/consulative framework and communication systems • Develop, document and communicate disaster management strategy • Education of industry stakeholders, employees, customers and community • Agreement on, and commitment to, activation protocols	*Risk assessment* • Assessment of potential disasters and their probability of occurrence • Development of scenarios on the genesis and impacts of potential disasters • Develop disaster contingency plans
2. *Prodromal* When it is apparent that a disaster is imminent	*Mobilisation* • Warning systems (including general mass media) • Establish disaster management command centre • Secure facilities	*Disaster contingency plans* • Identify likely impacts and groups at risk • Assess community and visitor capabilities to cope with impacts • Articulate the objectives of individual (disaster specific) contingency plans • Identify actions necessary to avoid or minimise impacts at each stage • Devise strategic priority (action) profiles for each phase ○ *Prodromal* ○ *Emergency* ○ *Intermediate* ○ Long-term recovery • On-going review and revision in the light of ○ *Experience* ○ *Changes in organisational structures and personnel* ○ *Changes in the environment*
3. *Emergency* The effect of the disaster is felt and action is necessary to protect people and property	*Action* • Rescue/evacuation procedures • Emergency accommodation and food supplies • Medical/health services • Monitoring and communication systems	
4. *Intermediate* A point where the short-term needs of people have been addressed and the main focus of activity is to restore services and the community to normal	*Recovery* • Damage audit/monitoring system • Clean-up and restoration • Media communication strategy	
5. *Long-term (recovery)* Continuation of previous phase, but items that could not be attended to quickly are attended to at this stage. Post-mortem, self-analysis, healing	*Reconstruction and reassessment* • Repair of damaged infrastructure • Rehabilitation of environmentally damaged areas • Counselling victims • Restoration of business/consumer confidence and development of investment plans • Debriefing to promote input to revisions of disaster strategies	
6. *Resolution* Routine restored or new improved state establishment	*Review*	

2.3 Conclusion

Hayashi (2013) indicated that preparedness is one of the foundations of risk reduction. Emergency planning and preparedness for a crisis are the most significant components for dealing with disasters (AlBattat and Som, 2013). Existing studies have focused on the impact of disaster events on tourism demand, development of tourism disaster management models, and formulation of strategies for certain stages, such as recovery strategies, or certain aspects, such as communication strategies. The works that considered the impact of disasters on tourism demand rarely mentioned earthquake events. Time-series models were usually applied to evaluate loss in visitor arrivals. In addition, few researchers took previous shock events into consideration in the impact of disasters on tourism demand.

Current tourism disaster frameworks represent a considerable progress in providing references for the tourism industry and tourism destinations. However, they are more similar to general disaster frameworks; in the developed models, few emphasize the uniqueness of the tourism industry. Meanwhile, comprehensive frameworks are not meaningful at all times because tourism destinations or disasters have unique characteristics.

Indeed, research on the impact of earthquakes on the tourism industry is limited, despite the need for approaches in formulating earthquake strategies for specific earthquake-prone destinations (Orchiston, 2010).

A proactive and strategic approach is necessary. It must correspond to earthquake disasters and enhance the resilience of the tourism industry. Two main parts need to be investigated, namely, tourism demand and tourism supply, with consideration for the uniqueness of the tourism industry and tourism disaster management.

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Chapter 3 Sensitivity of tourism demand to major earthquakes

3.1 Objectives

The importance of tourism demand in tourism can be concluded as “no tourism demand, no tourism industry”. The number of tourist arrivals has a direct impact on tourism industry and government agency investment. Therefore, policymakers either in tourism industry or in administrative organizations need to have a clear understanding of how disasters on tourism demand. Though tourism has been regarded as a strategic industry either in Japan or China, and they frequently experience many kinds of natural disasters, especially earthquakes due to their geological location, few literatures discussed the impact of huge earthquakes on tourism demand in Japan and China. The purpose of this chapter[1] is to make a better understanding of the changes and trends in the tourism demand by examining how severe the impact of the largest earthquakes, the 2011 Great East Japan Earthquake and the 2008 Wenchuan Earthquake, on tourism demand and estimate whether tourist arrivals have returned to normal up after one year or more of the earthquake occurrences.

3.2 Method

We apply ARIMA analysis introduced by Box and Jenkins (1976) to explore the impact of the earthquakes on the tourism demand and estimate the recovery level of tourism demand from the devastating earthquakes in Japan and China. The ARIMA time series analysis uses lags and shifts in the historical data to uncover patterns (e.g. moving averages, seasonality) and predict the future values. The ARIMA model was first developed in the late 60s but it was systemized by Box and Jenkins (1976). ARIMA processes provide a wide range of models for univariate time serials modeling and forecasting and have been successfully applied in economic, social issues and also in

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[1] This chapter is based on the following reviewed paper.

Wu, L.H. and Hayashi, H., The Impact of the Great East Japan Earthquake on Inbound Tourism Demand in Japan, Journal of Institute of Social Safety Science, No.21, pp. 109-117, 2013.

forecasting tourism demand (e.g. Gonza´lez and Moral, 1995; Lim and McAleer, 2002; Kulendran and Shan, 2002).

As mentioned in chapter 2 of literature review, some previous shocks may also impact tourism demand of the time and if they are not taken into considered, they may affect current forecasting accuracy. One-off events such as global financial crisis and deadliest disasters may distort the estimation and diagnosis, and then impact the accuracy of forecast. In order to account for the impact of one-off events, the method by using dummy variables to represent one-off events is often applied in tourism research (e.g. Witt et al, 1994; Lim and McAleer, 2002; Kulendran and Witt, 2003; Song and Witt, 2006; Salleh et al. (2007); Lim et al (2008); Kuo et al (2008); Lim et al (2009); Wang (2009); Yang et al. (2010); Nishimura et al., 2013). Therefore, in this study the impact of the exogenous shocks will be incorporated in ARIMA models by using deterministic dummy variables in order to improve forecasting accuracy.

To examine the impact of the Great East Japan Earthquake on inbound tourism demand to Japan, we employ ARIMA model with deterministic dummy variables to forecast the tourist arrivals and investigate the difference of predicted and actual values. Figure 3-1 shows the framework of the methodology in this study.

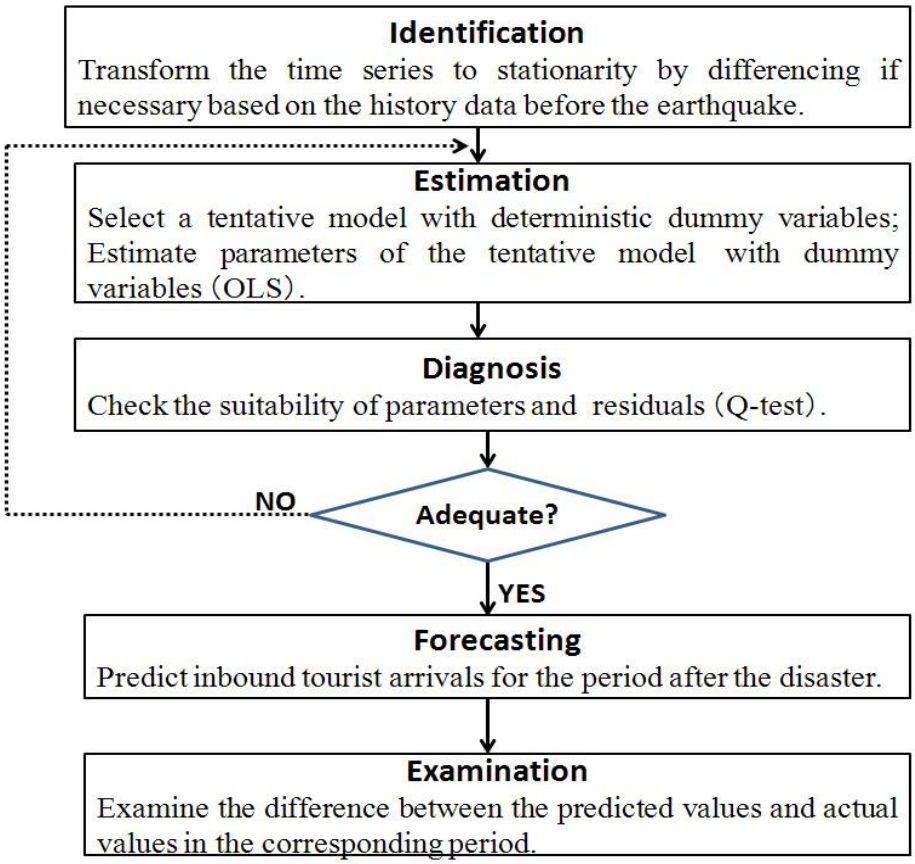

Fig. 3-1 The framework in this study.

ARIMA model is described as follows:

$$\mathbf{Y_t = c + \emptyset_1 Y_{t-1} + \emptyset_2 Y_{t-2} + \cdots \emptyset_p Y_{t-p} + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \cdots + \theta_q \varepsilon_{t-q} + \varepsilon_t} \quad [1]$$

where Y_t is the actual value at time of t; $\emptyset_i$ (i=1,2…p) and Θ_j (j=1,2…q) are parameters; ε_t is random error at time of t and is assumed to be independently. Equation1 can also be presented shortly in the following form

$$\mathbf{\emptyset(L) Y_t = C + \theta(L) \varepsilon_t} \quad [2]$$

where

$$\mathbf{\emptyset(L) = 1 - \emptyset_1 L - \emptyset_2 L^2 - \cdots - \emptyset_P L^P}$$

$\emptyset$ is a polynomial of the lag operator representing the auto-regression (AR) model that calculates the present value from past values;
and

$$\mathbf{\theta(L) = 1 + \theta_1 L + \theta_2 L^2 + \cdots + \theta_q L^q}$$

Θ represents the moving average (MA) model that calculates the present value from past error terms.

The stationarity of the time series can be tested by the figures of autocorrelation function (ACF) and partial autocorrelation function (PACF), and unit root test such as Dickey-Fuller test (Dickey and Fuller, 1979). Differencing (regularly or/and seasonally) is often applied to the time series to remove the trend and stabilize the variance before an ARIMA model is identified. Usually the differentiated ARIMA model can be presented as follows:

$$\mathbf{\emptyset(L) \Delta^d Y_t = \theta(L) \varepsilon_t} \quad [3]$$

where d is a degree of difference. As this study uses an ARIMA model with dummy variables to account for the impact of one-off events, the ARIMA model incorporating dummy variables is presented as follows:

$$\mathbf{\emptyset(L) \Delta^d Y_t = \theta(L) \varepsilon_t + \sum_{i=1}^{M} \beta_i D_i} \quad [4]$$

where D_i is a dummy variable and β_i is a parameter of the dummy variable. M is the

number of the dummy variables.

Based on the above procedure we can identify a likely ARIMA (p,d,q) model or ARIMA(p,d,q)(P,D,Q)s model if seasonality is indicated, with dummy variables.

In diagnosis procedure, Ljung-Box test (Ljung and Box, 1978) is used to test if the residuals of the fitted ARIMA model are white noise. The Ljung-Box Q test can be defined as follows:

Hypothesis: H_0: The data are independently distributed; H_1: The data are not independently distributed.

$$\mathbf{Q = n(n+2)\sum_{k=1}^{h}\frac{\rho_k{}^2}{n-k}} \qquad [5]$$

where n is the sample size, ρ_k is the sample autocorrelation at lag k, and h is the number of lags being tested. At significance level α, the critical region for rejection of the hypothesis of randomness is

$$\mathbf{Q > X^2{}_{1-\alpha,h}} \qquad [6]$$

where $X^2{}_{1-\alpha}$, h is the α-quantile of the chi-squared distribution with h degrees of freedom.

If the fitted model is adequate, it can be used to estimate the inbound tourism arrivals after the disaster. Then the impact level of the earthquake on inbound tourism demand is available from the difference between the estimated and the actual values.

3.3 The Great East Japan Earthquake

The 2011 earthquake off the Pacific coast of Tohoku that occurred on March 11, 2011 at 05:46 (UTC) offshore of the east coast of Honshu, Japan, had a magnitude of 9.0 on the Richer Scale and triggered a devastating tsunami resulting in serious nuclear disaster. The earthquake is also known as the Great East Japan Earthquake, 2011 Tohoku Earthquake or 3.11 Earthquake. The huge earthquake accompanying with tsunami and the accident of the nuclear plant in Fukushima caused considerable loss of casualties: 18,131 dead, 2,829 missing and 6,194 injured (FDMA, 2012).

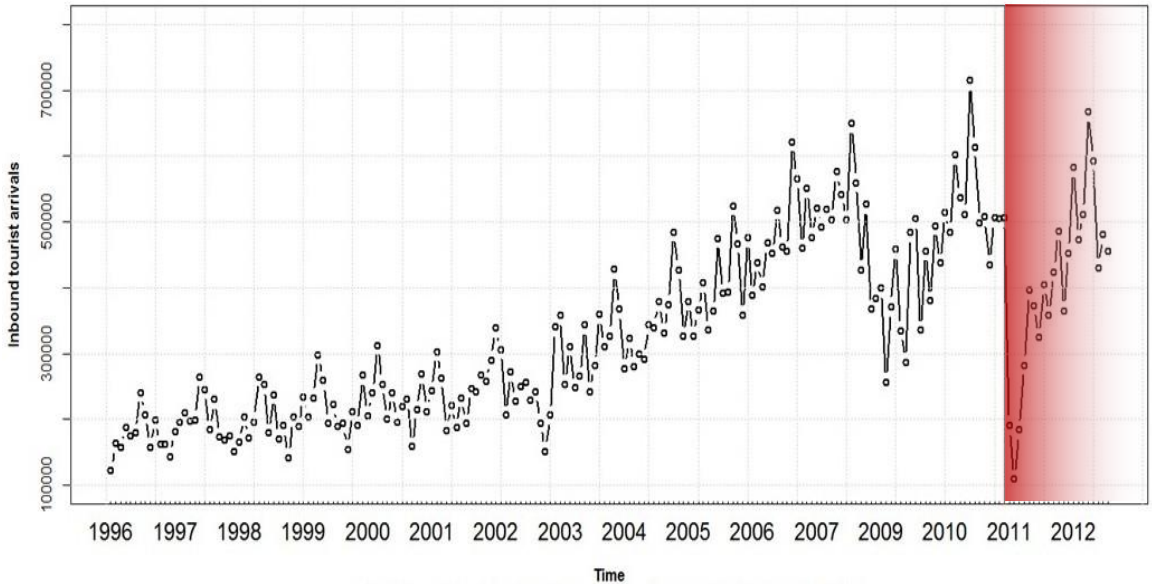

Fig. 3-2 Inbound tourist arrivals to Japan from January 1996 to November 2012. (Data source: JNTO)

The earthquake has also impacted inbound tourism demand in Japan severely. The report released by Japan National Tourism Organization (JNTO, 2012) suggests that soon after the huge earthquake during the period between 12 March and 31 March, the international visitor arrivals to Japan fell off sharply by 72.7% as compared with the same period in 2010. The visitor arrivals from abroad for the whole year (2011) decreased by 27.8 %, compared with that in the previous year (2010), which is the highest reduction in Japan's recorded history.

MLIT has been taking aggressive tourism promotion measures (MLITT, 2012a and 2012b) aiming at recovering and stimulating international travel demand, for example, by promoting MICE (Meetings, Incentives, Conferences, Exhibitions) in the affected areas, further reinforcing the framework for accommodating visitors from overseas and implementing new visa policies for Chinese, etc.

3.3.1 Data

The data used for Japan's case is monthly international tourist arrivals to Japan between January 1996 and November 2012 collected by JNTO (Online) (see Figure 3-2). Here international tourists mean the people who come to Japan for the purpose of tourism rather than business or others.

3.3.2 Analysis of ARIMA model with dummy variables

3.3.2.1 Identification

Figure 3-2 suggests that international tourist arrivals went down sharply after the Great East Japan Earthquake. As the time series has an upward trend as a whole (see Figure 3-2), we take logarithm to deal with this issue (see Figure 3-3). The ACF in Figure 3-3 shows there are spikes at several lags, so the new time series is nonstationary. So regularly first- time difference is necessary and the result is shown in Fig. 3-4.

From the ACF in Fig. 3-4, there is a spike at lag 12. So seasonally first- time difference is taken (see Figure 3-5) and ACF suggests the time series seems stationary. We use a unit root test (Dickey and Fuller, 1979) as a diagnostic tool to test whether the time series is stationary.

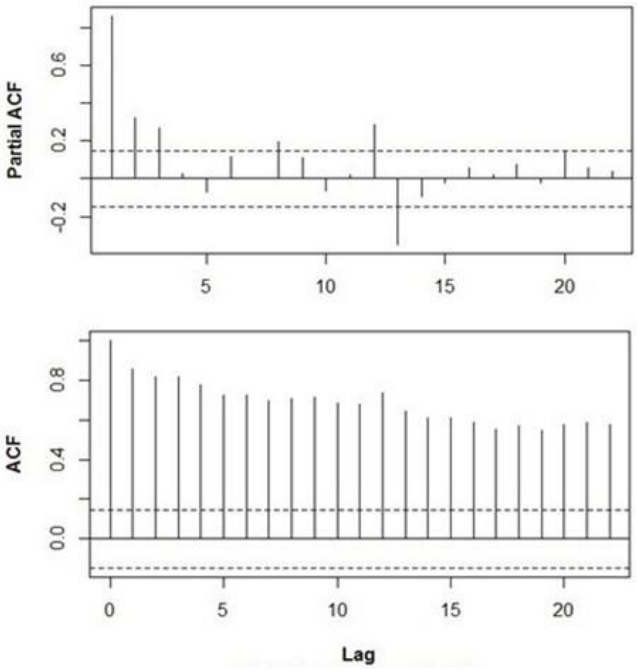

Fig. 3-3 Correlogram of LogYt.

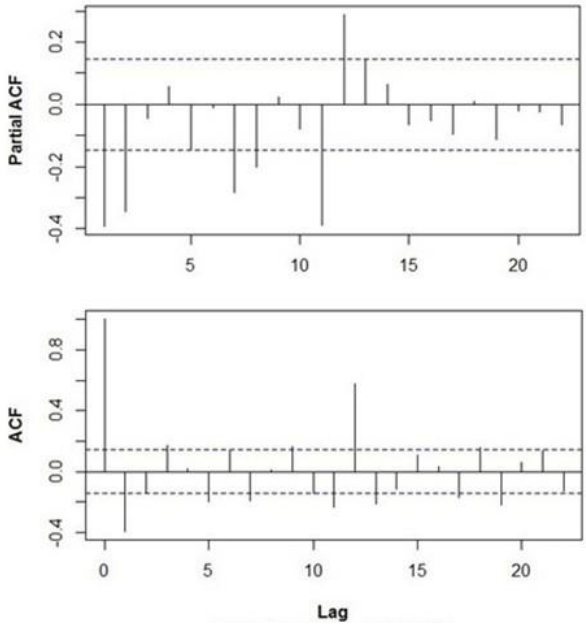

Fig. 3-4 Correlogram of DLogYt.

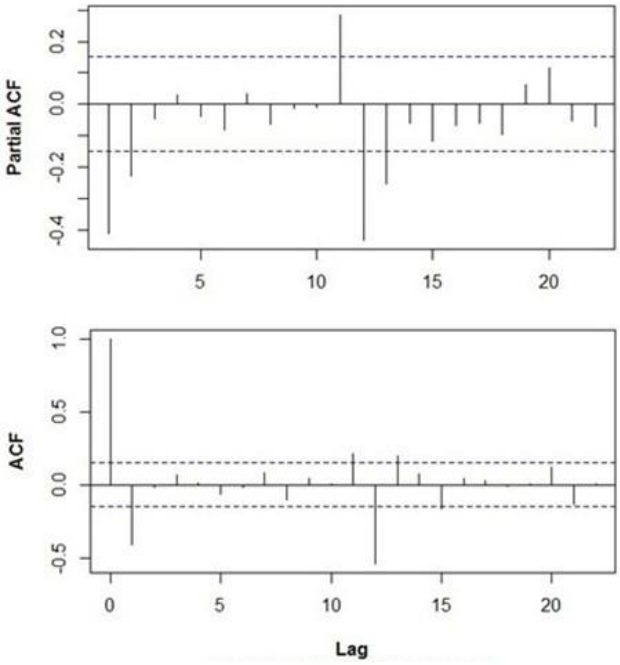

Fig. 3-5 Correlogram of D12DLogYt.

ADF test results propose that the t-value of ADF test statistic is smaller than the t-value of test critical values at 1% level significance (see Table 3-1). So the time series after transforming and differencing is stationary.

Table 3-1 ADF test result.

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.160237	0.0010
Test critical values:	1% level	-3.472259	
	5% level	-2.879846	
	10% level	-2.576610	

3.3.2.2 Estimation

During the period from January 1996 to February 2011, Japan mainly experienced the SARS global health crisis in 2003, Lehman shock of 2008, the movement of the Lunar year and the H1N1 Flu epidemic. Therefore, the ARIMA model incorporating dummy variables in this study can be presented as follows:

$$\emptyset(\mathbf{L})\Delta^{\mathbf{d}}\mathbf{LOGY_t} = \boldsymbol{\theta}(\mathbf{L})\boldsymbol{\varepsilon}_\mathbf{t} + \boldsymbol{\beta}_\mathbf{1}\mathbf{D_1} + \boldsymbol{\beta}_\mathbf{2}\mathbf{D_2} + \boldsymbol{\beta}_\mathbf{3}\mathbf{D_3} + \boldsymbol{\beta}_\mathbf{4}\mathbf{D_4} \qquad [7]$$

where D1 is a dummy variable with a value 1 for the SARS epidemic from April 2003 to June 2003 and is 0 otherwise [33)]. D2 is a dummy variable with a value 1 for Lehman shock of 2008 in the period between September 2008 and October 2009, and is 0 otherwise. D3 is a dummy variable with a value 1 for the movement of the Lunar year in February 2009, and is 0 for the otherwise. D4 is a value 1 for the H1N1 Flu epidemic from May 2009 to June 2009 (JNTO, 2010).

The ACF and PACF in figure 5 show that there are spikes at some lags. The dummy variables were incorporated into the ARIMA specifications and ARIMA (2, 1, 3) (1, 1, 1)$_{12}$ model seems appropriate by investigating the spikes at several lags. The tentative model (without a constant) based on the data before the disaster is presented as follows:

$$\begin{aligned}&(\mathbf{1} - \emptyset_\mathbf{1}\boldsymbol{L} - \emptyset_\mathbf{2}\boldsymbol{L}^\mathbf{2})(\mathbf{1} - \emptyset_\mathbf{1}\boldsymbol{L}^\mathbf{12})(\mathbf{1} - \boldsymbol{L})(\mathbf{1} - \boldsymbol{L}^\mathbf{12})\boldsymbol{LOGY_t}\\ &= (\mathbf{1} + \boldsymbol{\theta}_\mathbf{1}\boldsymbol{L} + \boldsymbol{\theta}_\mathbf{2}\boldsymbol{L}^\mathbf{2} + \boldsymbol{\theta}_\mathbf{3}\boldsymbol{L}^\mathbf{3})(\mathbf{1} + \boldsymbol{\theta}_\mathbf{1}\boldsymbol{L}^\mathbf{12})\boldsymbol{\varepsilon_t} +\\ &\qquad \boldsymbol{\beta}_\mathbf{1}\boldsymbol{D_1} + \boldsymbol{\beta}_\mathbf{2}\boldsymbol{D_2} + \boldsymbol{\beta}_\mathbf{3}\boldsymbol{D_3} + \boldsymbol{\beta}_\mathbf{4}\boldsymbol{D_4}\end{aligned} \qquad [8]$$

In this study, we apply Eviews 6.0 statistics software to estimate the parameters of the tentative model by using Ordinary Least Square (OLS), which is a method for estimating the unknown parameters in a linear regression model. The t-statistics of all parameters are significant at 5%level. The dummy variables, D1, D2, D3, are not significant at the level, therefore they are not included in this model. The estimation result is as follows

(with absolute t-ratios in parentheses):

$$(\mathbf{1}+\mathbf{0.48}\boldsymbol{L}+\mathbf{0.22}\boldsymbol{L}^{\mathbf{2}})(\mathbf{1}+\mathbf{0.22}\boldsymbol{L}^{\mathbf{12}})(\mathbf{1}-\boldsymbol{L})$$

(-5.91) (-2.44) (-2.78)

$$\times(\mathbf{1}-\boldsymbol{L}^{\mathbf{12}})\boldsymbol{LOGY}_{\boldsymbol{t}}=(\mathbf{1}-\mathbf{0.19}\boldsymbol{L}^{\mathbf{3}})(\mathbf{1}-\mathbf{0.94}\boldsymbol{L}^{\mathbf{12}})\boldsymbol{\varepsilon}_{\boldsymbol{t}} \qquad [9]$$

(-2.09) (-44.40)

$$-\mathbf{0.12}\boldsymbol{D}_{\mathbf{4}}$$

(-2.17)

3.3.2.3 Diagnosis

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.004	0.004	0.0019	
		2	0.004	0.004	0.0043	
		3	0.010	0.010	0.0200	
		4	-0.047	-0.047	0.3817	
		5	-0.065	-0.065	1.0663	
		6	-0.044	-0.043	1.3783	0.240
		7	0.061	0.063	1.9962	0.369
		8	-0.028	-0.029	2.1300	0.546
		9	-0.046	-0.052	2.4804	0.648
		10	0.023	0.014	2.5688	0.766
		11	0.007	0.008	2.5761	0.860
		12	-0.018	-0.014	2.6294	0.917
		13	0.018	0.015	2.6857	0.953
		14	0.007	-0.004	2.6946	0.975
		15	-0.190	-0.191	8.9862	0.533
		16	-0.063	-0.060	9.6874	0.559

Fig. 3-6 Estimation results by Eviews 6.0.

There are no marginally significant spikes at lag 1 and the seasonal lag in the ACF in Figure 3-6. The Q-statistic for the ACF reinforces this judgment. $Q=8.986<X^2_{0.05}(15)=24.996$, and this value of Q corresponds with a 0.533 level of significance. So we accept residuals as white noises and apply the fitted model for forecasting tourist arrivals.

3.3.2.4 Forecasting and examination

In this section we use ARIMA (2, 1, 3) $(1, 1, 1)_{12}$ model incorporating statistically significant one-off events to generate forecasts of inbound tourist arrivals to Japan for the period from March 2011 to November 2012, and mixed results are obtained (see Table 3-

2). The results show that the H1N1 Flu epidemic has negatively and significantly distorted inbound tourism demand to Japan. The other shocks had no significant impact on tourism demand. Actual values, estimated values, the difference of them and the percentage of difference are shown in table 1. The results suggest that the earthquake did impact inbound tourism demand severely (in the first three months after the earthquake dropped by 63.62%, 82.42%, and 64.66% respectively). Up to November 2012, the percentage of difference between the estimated and actual values hovered near the normal level. The largest difference (-510243) came in the following month of the catastrophe occurring and the smallest difference (-2978) was in June 2012.

Table 3-2 and Figure 3-7 provide graphical presentations of empirical findings. According to table 3-2 and Figure 3-7, the differences between the predicted and actual numbers of tourist arrivals for the 21 months have decreased significantly on the whole. Though tourist arrivals are bouncing back from the devastating earthquake, the figures for March 2011, April 2011, February 2012, June 2012, and October 2012 need further discussion. As the Great East Japan Earthquake occurred in mid-March 2011, the total number of tourist arrivals in March was not lowest. The largest difference in the forecast period falls in April 2011 with the data of 510243. The difference in this month demonstrates the volume of decreased tourist arrivals caused by the earthquake. For the entire forecast period, the smallest difference falls in June 2012 with the data of 2978, during which actual arrivals are very close to the estimated ones. Figure 3-8 illustrates the trend of convergence between actual and estimated arrivals following the earthquake. It should be noted that February is usually shoulder season for the inbound tourism, however, the actual number of tourist arrivals decreased as Chinese Spring festival, during which Chinese tourist arrivals to Japan are usually numerous, moved to January in 2012 (JLL, 2012). It should also be noted that the actual number of tourist arrivals in October, usually boom season for the inbound tourism market, increases, though the difference is still large as the actual tourist arrivals has been impacted by nuclear pollution problem, the problem of the Senkaku Islands between China and Japan and so on (JNTO, 2012).

Table 3-2 Actual and forecasting values of inbound tourist arrivals after the Earthquake

Year/Month	Actual value	Estimated value	Difference (Act-Est)	% Diff (Diff/Est*100%)
2011/03	190730	524337	-333607	-63.62%
2011/04	108820	619063	-510243	-82.42%
2011/05	183799	520107	-336308	-64.66%
2011/06	282118	494469	-212351	-42.95%
2011/07	396559	674542	-277983	-41.21%
2011/08	373195	615213	-242018	-39.34%
2011/09	323947	452787	-128840	-28.45%
2011/10	404377	562356	-157979	-28.09%
2011/11	358056	456797	-98741	-21.62%
2011/12	423650	508098	-84448	-16.62%
2012/01	485860	489081	-3221	-0.66%
2012/02	364537	485069	-120532	-24.85%
2012/03	452568	511008	-58440	-11.44%
2012/04	582511	609030	-26519	-4.35%
2012/05	473662	520959	-47297	-9.08%
2012/06	511483	514461	-2978	-0.58%
2012/07	666623	678085	-11462	-1.69%
2012/08	592810	610593	-17783	-2.91%
2012/09	430025	459122	-29097	-6.34%
2012/10	480254	546065	-65811	-12.05%
2012/11	455665	458829	-3164	-0.69%

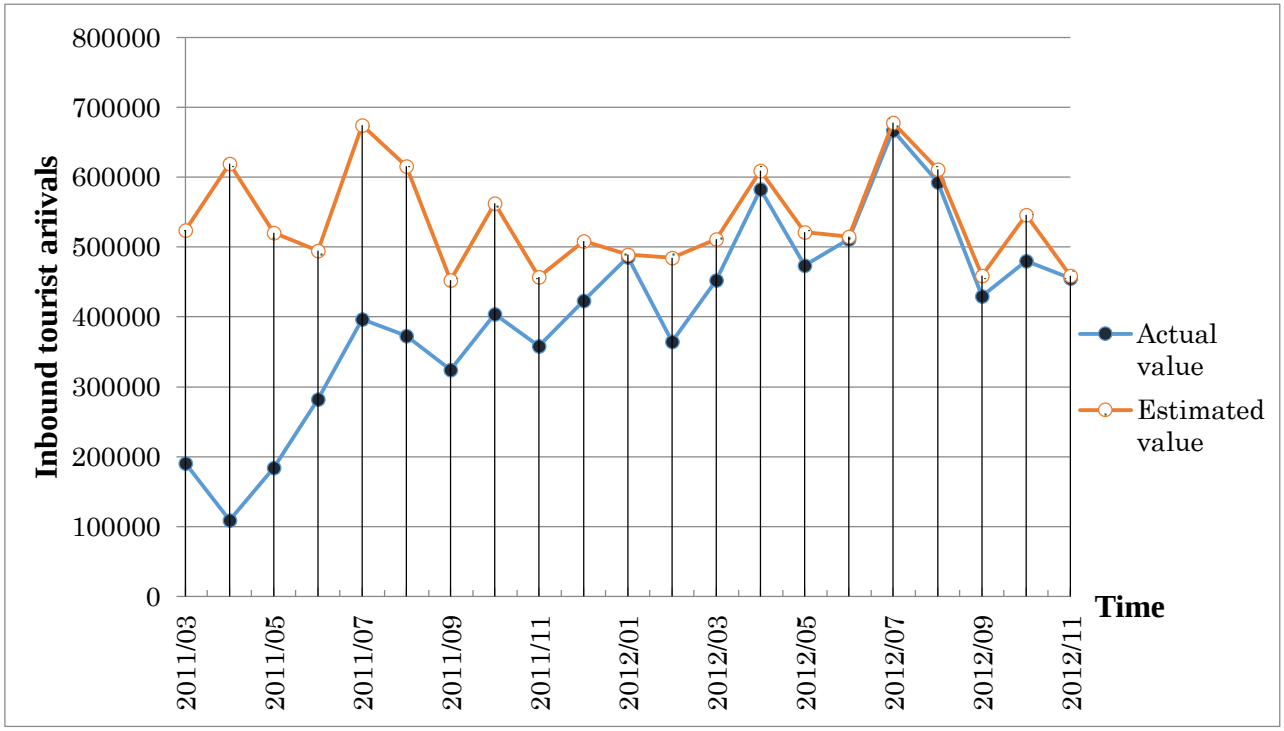

Fig. 3-7 Actual and estimated values of inbound tourist arrivals.

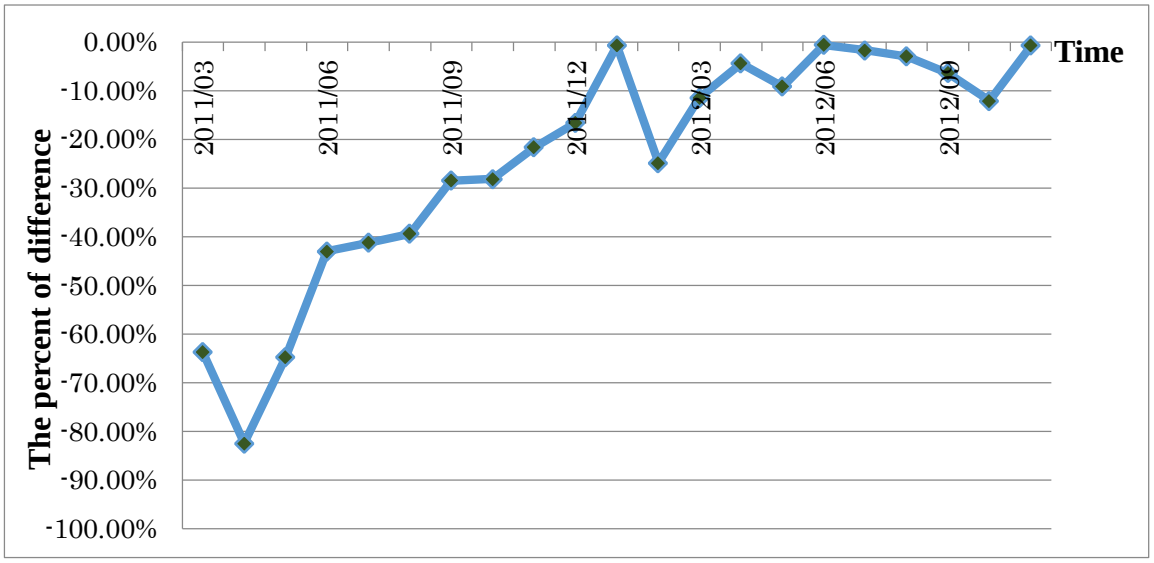

Fig. 3-8 Difference percentage between actual and estimated values.

According to the recovery process (see Figure 3-7 and Figure 3-8), the entire forecast period from March 2011 to November 2012 can be divided into two stages and January 2012 is the cut-off point of recovery process. Before the month, inbound tourist arrivals recovered quickly, but after the point, the difference percentage fluctuated and was close to the normal level. Figure 8 also indicates that the forecast model follows the overall trend in inbound tourism demand.

If compared with the case of September 21 Earthquake in Taiwan (Huang and Min, 2002), the convergence is much faster in the case of Japan. In the case of Taiwan with the magnitude of 7.3, which is lower than that of 9.0 in the case of Japan, after 11 months there was still a 5% decrease in international tourist arrivals. The recovery process of Japan reached 0.7% decrease after 11 months.

3.3.3 Conclusion

The number of inbound tourist arrivals directly impacts the tourism industry and the investments of government agencies therein. Therefore, policymakers need to make a better understanding of how natural disasters affect inbound tourism demand. This study finds that the devastating earthquake affected inbound tourism demand in Japan most negatively, and the inbound tourism demand in Japan has not yet fully recovered from sharply decreased inbound tourist arrivals due to the earthquake after 21 months. It is also found that the number of inbound tourist arrivals recovers rapidly in the early part of the recovery process; however, the difference percentage fluctuates and is close to the normal level later.

Faced with the fierce competition on tourism market, having a high market share is critical for the economic prospects of destination countries. It is suggested that the policymakers in Japan keep a close watch on the recovery level of inbound visitors, including the segments of the market such as tourist market and business travel market, in order to adopt appropriate incentives in timely manner. According to the message from the Director General, Japan Tourism Agency (2012), inbound visitor arrivals has recovered to the normal level up to July 2012, however, it does not mention the recovery level of inbound tourist arrivals. It may lead the tourism industry and policymakers to launching the strategies with the aim of keeping or developing inbound tourism demand rather than recovery strategies.

In regards to time-series analysis, this study finds that exogenous variables may have significant impact on forecast. Unlike the other time-series models that just take time series data into consideration, in order to improve forecast accuracy, our study incorporates actual known periods of one-off shock events in ARIMA model through the use of dummy variables. During the observation time period, Japan mainly experienced the shocks of SARS, the Lehman shock, and the Lunar year movement and the H1N1 Flu epidemic occurring in the period of Lehman shock. The results find that the H1N1 Flu epidemic in the period of the Lehman shock has negatively impacted inbound tourism, as the estimation parameter is negative 0.12 and the other dummies had no significant impact on tourism demand as they are significant at the 5% level. This study presents contributions to the research regarding the effective use of forecasting models to estimate the recovery status of tourism demand from disasters.

This study is limited to investigating the recovery status of inbound tourism demand. It does not explore the impact of the disaster on domestic tourism demand, as the statistics of domestic tourist in Japan is limited. It would be interesting to compare the recovery status of domestic and inbound tourism demand after disasters. This study only focuses on inbound tourist arrivals. It does not attempt to uncover the inbound tourists' travel motivations, and furthermore, examine the factors that affect the travel demand in Japan.

Hayashi (2007) indicates that the recovery from recent disaster is a long term recovery process which is a time consuming and complicated process. This study finds that the recovery process is complex rather than simple linear recovery. As it is estimated that there will be Large-scale earthquakes such as Tokyo inland earthquake and Nankai Trough earthquake in the near future in Japan (Cabinet Office, Government of Japan, 2011), hence, this study suggests that to improve the resilience of tourism industry, the Japanese government and tourism industry put crisis management in tourism on agendas. Though the researchers such as Faulkner (2001) and Ritchie (2004) provide tourism disaster management frameworks for all tourism industries, international tourists are not

homogeneous and the conditions of destination countries are also diverse, so a common crisis management framework will not achieve the expected outcome. It will be especially interesting to study and develop tourism crisis management framework for Japan in the future.

3.4 The 2008 Wenchuan Earthquake

The 2008 Wenchuan Earthquake that occurred on May 12 at 06:28 (UTC) in Sichuan Province, had a magnitude of 8.0 on the Richer Scale and caused considerable loss of casualties, including 69,195 dead, 374,177 injured and 18,392 missing (Chinanews.com, 2008). The earthquakes caused a large number of buildings and infrastructures ruined, highways, water supply and power systems destroyed or affected, and a vast amount of sewage and garbage generated. The earthquake significantly affected all industries, including the tourism industry, in the areas in which they struck. Figure 3-9 shows the Inbound and domestic tourists in Sichuan between Dec. 2004 and Apr. 2010. There were sharp reduce either in inbound tourist arrivals or in domestic ones.

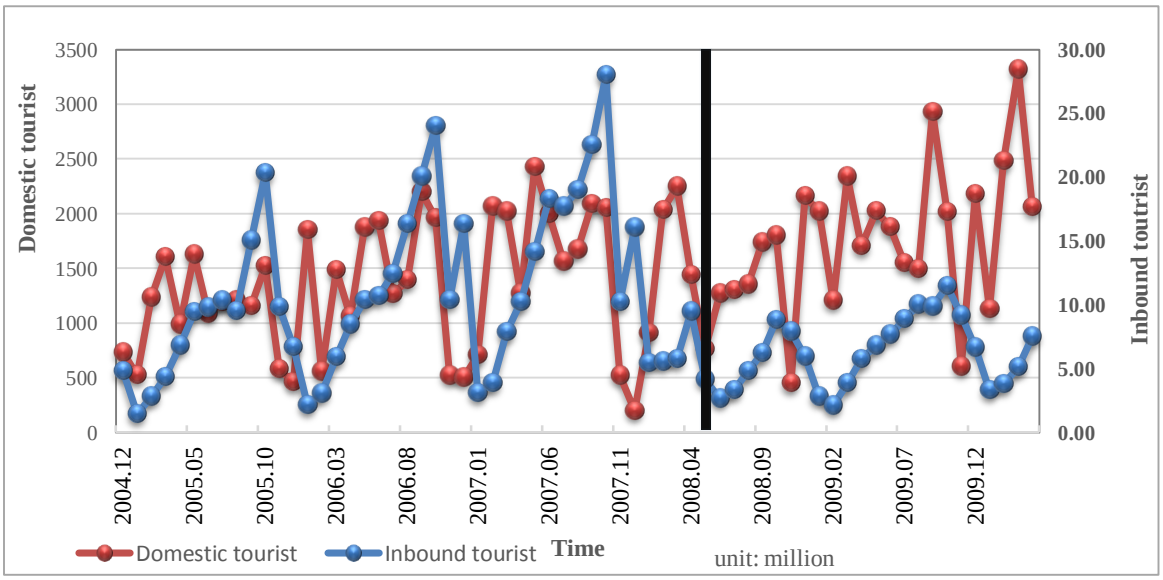

Fig. 3-9 Inbound and domestic tourists in Sichuan between Dec. 2004 and Apr. 2010. (Data source: Sichuan Tourism Administration)

3.4.1 Data

The data in this case include monthly inbound and domestic tourist arrivals to Sichuan province individually. The data were from online data of Sichuan tourism agency of

Sichuan government.

3.4.2 Results

Based on the same method, the results are shown as follows. Figure 3-10 shows actual and estimated values of inbound tourists after the 2008 Wenchuan Earthquake. And Figure 3-11 presents difference percentage between actual and estimated values. It seems that there is still a large gap between "normal" and actual values until March 2010. The result may largely be impact by the 2009 global financial crisis.

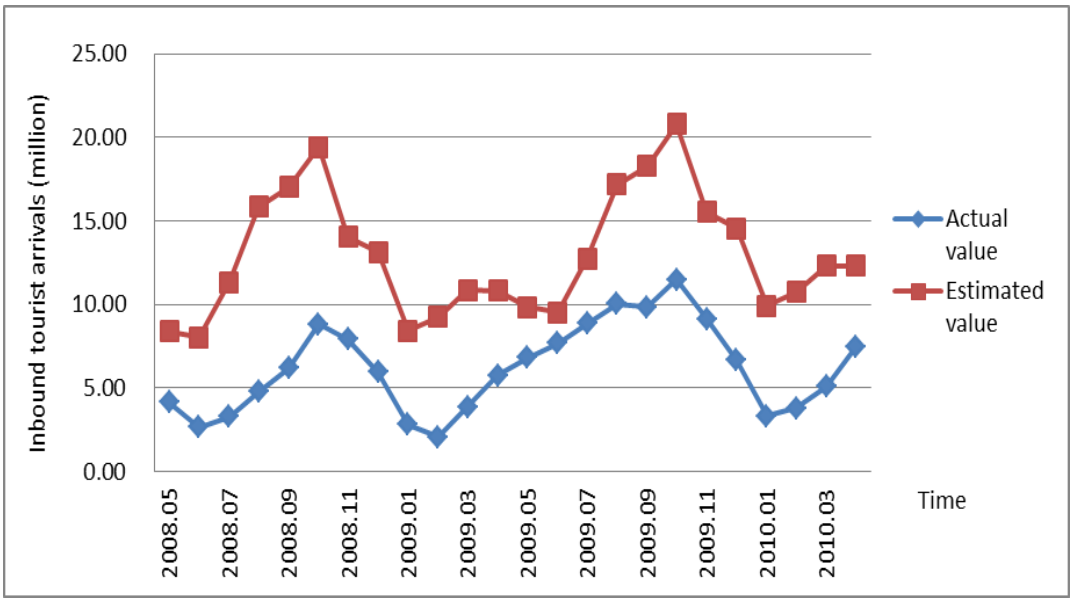

Fig. 3-10 Actual and estimated values of inbound tourists after the earthquake.

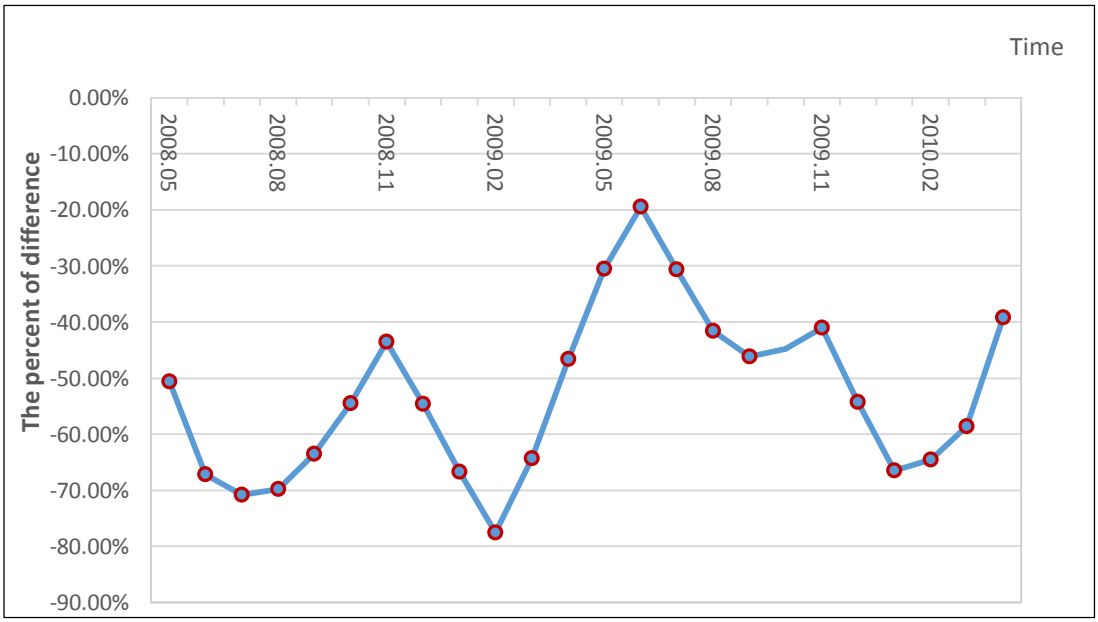

Fig. 3-11 Difference percentage between actual and estimated values (inbound).

Figure 3-12 and Figure 3-13 show the domestic tourist arrivals to Sichuan. The results denote that the domestic tourist arrivals got quickly recovered. The figures show after six months of the earthquake, domestic marketing of Sichuan got recovered. But at the early stage, the visitors reduced sharply, nearly -80%.

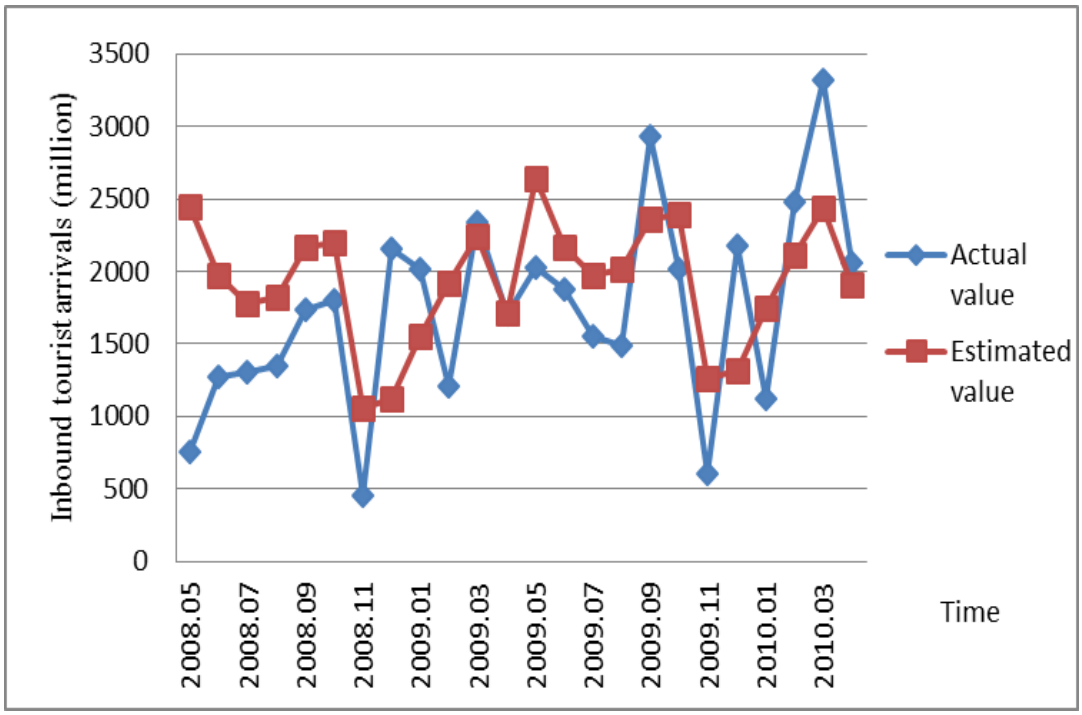

Fig. 3-12 Actual and estimated values of domestic tourists after the earthquake.

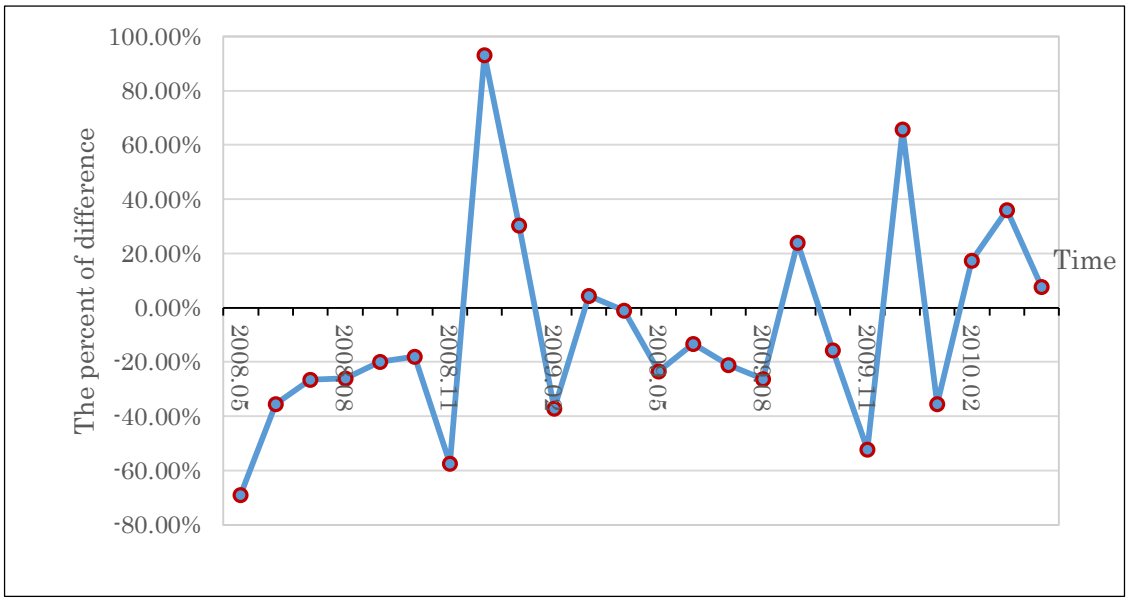

Fig. 3-13 Difference percentage between actual and estimated values (domestic).

3.4.3 Conclusion

For the case of Sichuan, China, the 2008 Wenchuan Earthquake significantly impacted inbound and domestic tourism demand. Domestic tourism marketing is the main part for the province. In the following step, it is of importance to know why they come and what kind of characteristics make them come to impacted sites, in order to provide references in future or other similar regions as Sichuan.

3.5 Discussion

Tourism is leisure activities with many enjoyment purposes other than for work or study, and safety and security are prerequisite in choosing tourism destination. Meanwhile, tourism destinations with high substitutability in tourism demand, are facing heavy competition for visitor arrivals. Candela and Figini (2012) explained the phenomenon of the high substitutability between far-away destinations. So the inbound tourism demand is more significantly impacted by external shocks. Tourism industry is based on and characterized by tourist flows. Few research targeted earthquake in tourism study. This study demonstrated that huge earthquakes significantly impacted tourist flows, especially inbound tourists. Because of visitor reduction, tourism business in the destinations would be affected, even the whole destination by means of cascade effect. It is suggested that the policy makers should upgrade attention to earthquake disasters in earthquake-prone destinations. From this point, it is required to explore and compare the main disasters that impact tourism demand in earthquake-prone regions. The results indicated that the most affected duration is the first 3~5 months after huge earthquakes' occurrence, then tourist arrivals rebound with fast recovery process, and lastly it cost time to achieve eventual normal level, that is, from sharp decline period, to rapid rebounding period, and then to period of wandering.

Since tourism recovery has its own characteristics, it is suggested that communication strategies should also take recovery patterns into consideration. For example, in sharp decline period, destination restoration should be put first, as too much marketing promotion may be counterproductive, and in recovery period, proactive marketing strategies are recommended.

As safety and security are most considered issues, when huge earthquakes happen, how to help tourists evacuate and help them return home are critical points that should be included in tourism crisis management. Furtherly, tourist is the core of tourism system; therefore, tourist's perception which may influence decision making of potential tourism should also be considered, as word of mouth plays a critical role in tourism.

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Chapter 4 Impact of disasters on Japan's inbound tourism demand

4.1 Objectives

Japan's long history as a safe and secure destination with safe food, low crime rate, low risk of epidemic diseases, etc., has made Japan most competitive in the inbound tourism market among Asia's many competitors. Japan has suffered from many different disasters, especially natural disasters such as earthquakes and tsunamis due to its geographical location near major tectonic boundaries.

International tourism demand has itself been subjected to natural disasters such as earthquakes, tsunamis, and volcano eruption, as well as man-made disasters such as terrorist attacks, infectious diseases, and economic crises. Murphy and Bayley (1989) indicated that tourism is especially vulnerable to a range of disaster occurrences because it depends so much on numerous components and individual businesses. Tourism demand is sensitive to catastrophic influences, and part of its long-term volatility is due to the variety of shocks to the tourism system from external events (Frechtling, 2001). The impact of huge disasters on tourism demand is enormous, and adversely affects the tourism industry at its destination. Severe Acute Respiratory Syndrome (SARS), for instance, which was pandemic from April to June 2003, greatly decreased international visitor arrivals to Japan compared with the same months in 2002, i.e., 23.1% in April 2002, 34.2% in May 2002, and 20.1% in June 2002 (JNTO, 2004). A Japan Tourism Agency report (2012) showed that soon after the Mw 9.0 Great East Japan Earthquake, i.e., between March 12 and 31, international visitor arrivals in Japan fell off sharply by 72.7% compared to the same period in 2010. Inbound visitor arrivals in 2011 decreased by 27.8% compared to that in 2010, which was the worst reduction in Japan's recorded history.

Literature about disaster effects on tourism is substantial, with most focusing on impact evaluation of certain disasters on tourism industry by applying economic analysis and proposing strategies for the tourism industry. Nevertheless, a few studies have assessed disaster impact on tourism demand and have demonstrated that disasters impacted severely on tourism demand (Mansfeld, 1999; Huang and Min, 2002; Ichinosawa, 2006; Kuo et al., 2008; Araña and León, 2008; Wang, 2009; Wu and Hayashi,

2013). Fewer reports have investigated the pattern and duration effects of disasters on tourism demand.

The purpose of this chapter[2] is to examine the impact of disasters on international tourism demand for Japan by applying an Autoregressive Integrated Moving Average (ARIMA) intervention analysis, to improve the understanding of patterns and the duration of effects. This would thus presumably provide useful insights on policymaking relevant to the tourism industry.

We mainly ascertain how the disasters impact on inbound tourism demand based on the following two propositions:

Proposition 1: Large earthquakes most significantly impact inbound tourism demand for Japan.

Proposition 2: The significant impact of disasters is temporary rather than permanent.

4.2 Data and Method

4.2.1 Case selection

Based on the principle of preparing for the worst, mentioned earlier, fitting is done on the time series of inbound tourist arrivals and we get residuals from differences in actual and fitted values. Based on residuals that are sorted by ascending order, we choose four main disasters for each type, for 12 in all, as shown in Table 1.

Table 4-1 Cases selected to test

No	Geological disaster	Extreme weather events	Others
1	2003.05 Miyagi-Oki Earthquake	2000.09 Heavy Rainfall Disasters in Tokai District	2001.09 The 9/11 attack
2	2003.09 Tokachi-Oki Earthquake; Bridgestone's Tochigi Plant Fire	2005.01-02 Blizzard in Tohoku	2003.04-06 SARS epidemic
3	2008.06 Iwate-Miyagi Nairiku earthquake	2006.11 Saroma tornado	2008.09 Lehman Shock
4	2011.03 The Great East Japan Earthquake	2008.03 Tornado in Kagoshima Prefecture	2009.05-06 Influenza epidemic

[2] This chapter is based on the following reviewed paper.

Wu, L.H. and Hayashi, H., The Impact of Disasters on Japan's Inbound Tourism Demand, Journal of Disaster Research Vol.9 No.sp Sep. pp. 699-708, 2014.

4.2.2 Data

To test the two propositions requires time series data on inbound tourist arrivals, so the data used in this study consists of monthly international tourist arrivals in Japan for the 17 years from January 1996 to February 2013 collected by the Japan National Tourism Organization (JNTO) (Figure 4-1). Here international tourists refer to the people who come to Japan for the purpose of tourism, rather than for business and others.

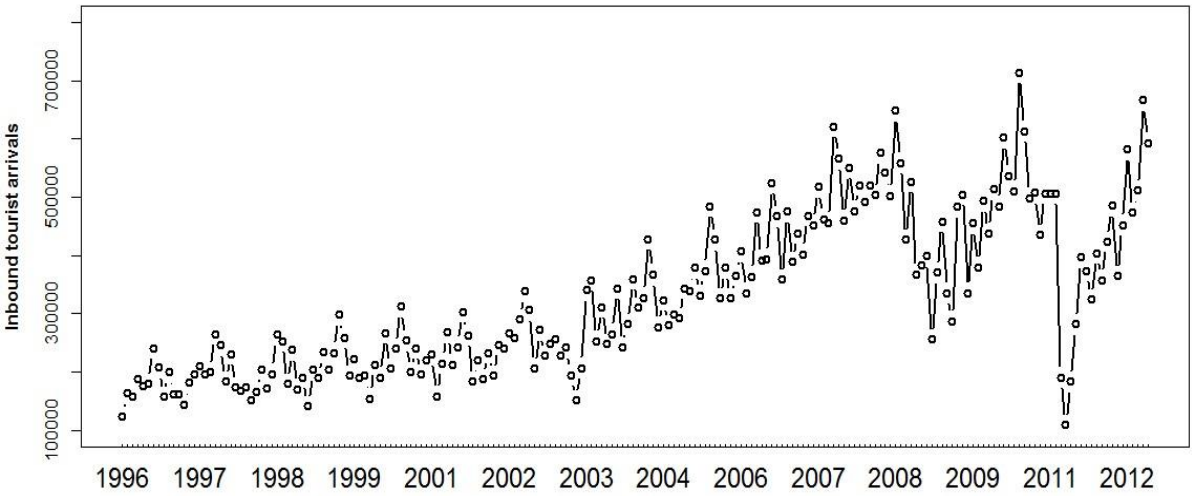

Fig. 4-1 Inbound tourist arrivals at Japan from January 1996 to August 2012. (Data source: JNTO).

4.2.3 Method

Testing these two propositions requires time series data on inbound tourist arrivals, so the data used in this study consists of monthly international tourist arrivals in Japan for the 17 years from January 1996 to February 2013 collected by the Japan National Tourism Organization (JNTO) (Figure 4-1). Here international tourists refer to the people who come to Japan for the purpose of tourism, rather than for business and others.

Japan has long enjoyed a reputation of being a safe tourism destination and is known for its low crime rate and low risk for communicable diseases. Japan is located, however, at a point where four of the planet's 10 tectonic plates crash against each other, resulting in frequent earthquakes. This study focuses on natural disasters and divides disasters into geological disasters, extreme weather events, and "others". Geological disasters refer to disasters caused by geological disturbances often caused by in tectonic plate shifts and seismic activity such as earthquakes, tsunamis, volcanic eruptions, and avalanches.

Extreme weather events involve unusual temperature, wind, or moisture. Many other disasters in addition to geological disasters and extreme weather events may adversely affect tourism demand. These include terrorist attacks, epidemics of infectious disease and financial crisis.

Previous studies (Goh and Law, 2002; Lee, 2008; Lai and Lu, 2005) showed that ARIMA intervention model outperforms other time series models in forecasting performance. This study applies ARIMA intervention analysis to examine the impact of disasters on inbound tourist arrivals in Japan. The empirical analysis undertaken in this study is mainly based on ARIMA intervention analysis as this relates to inbound tourist arrivals. Intervention analysis, which was developed by Box and Tiao (1975), is widely used in analyzing the impact of external shocks or interventions in different research fields, including tourism research. These shocks or interventions may be constant or temporary, gradual or abrupt. McCain and McCleary (1979) provided specific procedures for applying ARIMA intervention analysis and summarized into four practical steps as shown in Figure 4-2.

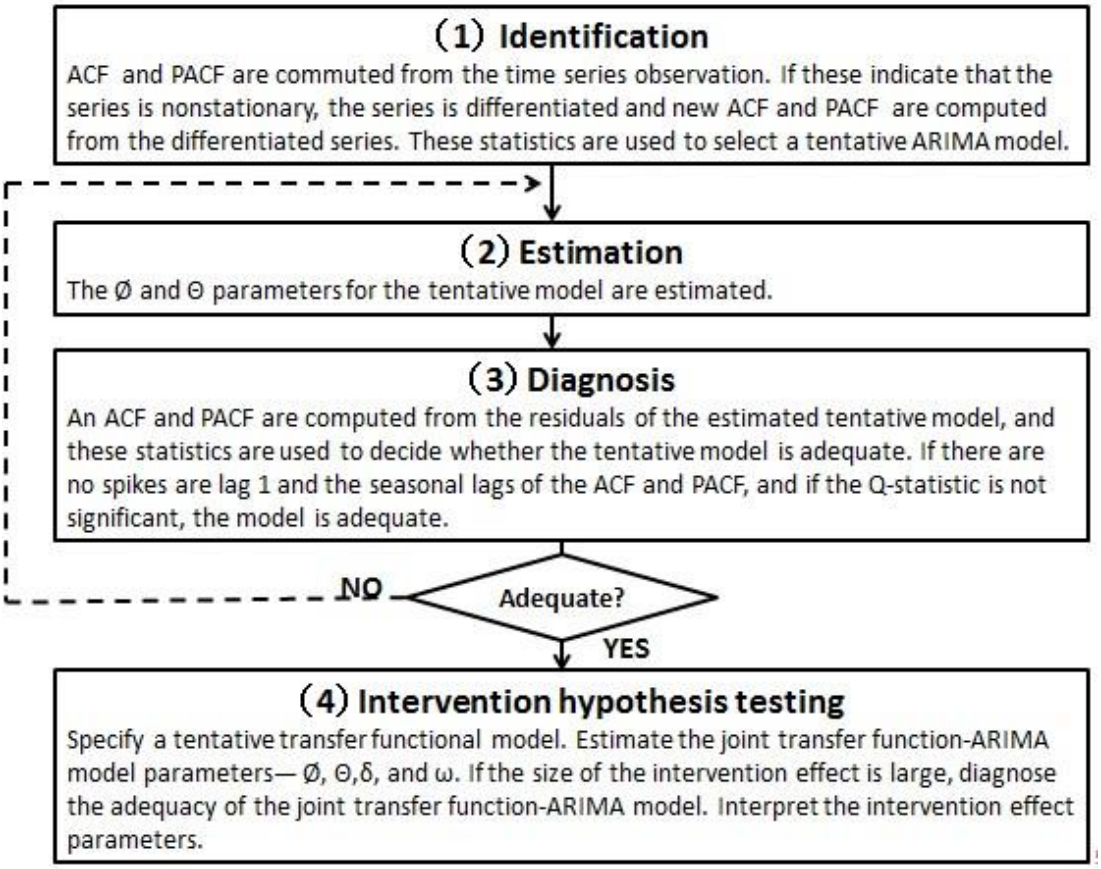

Fig. 4-2 The modeling strategy for intervention analysis. (Reference to McCain and McCleary, 1979)

4.2.3.1. Identification

The first step in model identification is to analyze data and diagnose whether the time series of inbound tourist arrivals is stationary or nonstationary. Stationarity is tested by using a correlogram, which includes the estimated autocorrelation function (ACF) and the partial autocorrelation function (PACF) of briefly define residuals. Another evaluation tool is the unit root test, a formal tool for testing the stationarity of a time series. The augmented Dickey-Fuller (ADF) test is applied most often to examine the briefly define unit root. For a nonstationary series, regular and/or seasonal "differencing" is often used to remove trends and stabilize variance. The differentiated ARIMA model is presented as follows:

$$\emptyset(\mathbf{L})\Delta^{\mathbf{d}}\mathbf{Y_t} = \boldsymbol{\theta}(\mathbf{L})\boldsymbol{\varepsilon}_{\mathbf{t}} \qquad [1]$$

where Y_t is monthly inbound tourist arrivals to Japan. $\emptyset$ (L) and Θ (L) are represented as follows:

$$\emptyset(\mathbf{L}) = \mathbf{1} - \emptyset_{\mathbf{1}}\mathbf{L} - \emptyset_{\mathbf{2}}\mathbf{L}^{\mathbf{2}} - \cdots - \emptyset_{\mathbf{P}}\mathbf{L}^{\mathbf{P}} \qquad [2]$$

$$\boldsymbol{\theta}(\mathbf{L}) = \mathbf{1} + \boldsymbol{\theta}_{\mathbf{1}}\mathbf{L} + \boldsymbol{\theta}_{\mathbf{2}}\mathbf{L}^{\mathbf{2}} + \cdots + \boldsymbol{\theta}_{\mathbf{q}}\mathbf{L}^{\mathbf{q}} \qquad [3]$$

where $\emptyset$ (L) is an autoregressive (AR) operator with parameters $\emptyset_p$ that represents polynomials of order p in backward shift operator L. Θ (L) is a moving average (MA) operator with parameters Θ_q that represents polynomials of order q in backward shift operator L. Sample ACFs and PACFs are observed to identify AR and MA models. d denotes order differencing. ε_t is random error and assumed to be independently and identically distributed within a mean of Zero and a constant variance of σ^2.

4.2.3.2. Estimation

After identification, parameters in the ARIMA process are estimated by fitting the model to a time series using the method of least squares. In this study, we use a significance level at 10%.

4.2.3.3. Diagnosis

Diagnosis is implemented by examining residuals from the estimated tentative model to check whether the model is adequate. ACF and PACF are calculated from residuals of the estimated tentative model, and these statistics are used to decide whether the tentative model is adequate. If there are no spikes at lag 1 and seasonal lags of the ACF and PACF and if the Q-statistic is not significant, the model is adequate. The Ljung–Box Q (Ljung and Box, 1978) is used for testing if residuals of the estimated tentative model are white noise. Only if a model meets both criteria of ACF and PACF lags, and the Q-statistic, is the model regarded as an adequate model and analysis moves to intervention hypothesis testing. Otherwise, the cycle of identification, estimation and diagnosis is repeated until

an adequate model is found.

4.2.3.4. Intervention Hypothesis Analysis

The intervention functions discussed as such where in this study consist of three types of change in the series: an abrupt, permanent change; a gradual, permanent change; and an abrupt, temporary change.

(1) An abrupt, permanent change

$$\mathbf{Y_t = \omega I_t + noise} \qquad [4]$$

where ω is a parameter interpreted as the magnitude of abrupt, constant change. Noise is estimated by using the ARIMA model. Independent variable It, meaning "intervention at time," is a dummy variable defined as follows：

$$I_t = \begin{cases} 0, \text{ before the intervention, } t < i \\ 1, \text{ after the intervention, } t \geq i \end{cases}$$

where i is the time of the intervention.

(2) A gradual, permanent change

$$\mathbf{Y_t = \delta Y_{t-1} + \omega I_t + noise} \qquad [5]$$

where δ is a parameter to be estimated from data.

In equation 5, the parameter δ in effect determines how gradually the series will change this level. When δ is large, say δ=0.9, the series changes its level substantially over a long period of time, reaching its asymptotic post treatment level slowly. When δ=0, equations 4 and 5 are identical. The intervention hypothesis test for equation 5 is a test of significance for both δ and ω.

(3) An abrupt, temporary change

A pattern of effect is generated by equation 5 when I_t is defined as a pulse function. That is,

$$I_t = \begin{cases} 1, \text{ at the moment of intervention,} \\ 0, \text{ otherwise} \end{cases}$$

To test the nature of interventions, avoiding a priori and bias choice among models of impact, we use the general function in equation 5 as the initial tentative transfer function model and assume that the impact of each disaster is abrupt but temporary.

The specified transfer function is added to the previously identified ARIMA noise model to form a tentative joint ARIMA intervention model. Parameters Ø, Θ, δ, and ω for the joint model are then estimated.

Tests of significance for intervention parameters are interpreted to decide whether the null hypothesis of no intervention is to be rejected or not.

4.3 Empirical analysis

In this study, the 2011 Great East Japan Earthquake is used as an example for determining whether this disaster impacted international tourism demand to Japan by using intervention analysis.

4.3.1 Identification

In this case, data on inbound tourist arrivals from January 1996 to February 2011 are used for the identification process. As the ACF of the series in Figure 4-3 shows spikes at lags, the new time series is nonstationary. So regularly first-time difference is necessary and we differentiate the time series and get the result shown in Figure 4-4, in which several spikes at lag 12, 24, 36 occur in ACF. Another seasonal difference is necessary and the result is shown in Figure 4-5. The ADF test for a unit root is applied to test stationarity of the series after differentiated. The calculated ADF test statistic with a value of -4.16 for the series is less than the critical value of -2.87 at the 5% significance level. Because the null hypothesis of a unit root is rejected, this means that the series is stationary.

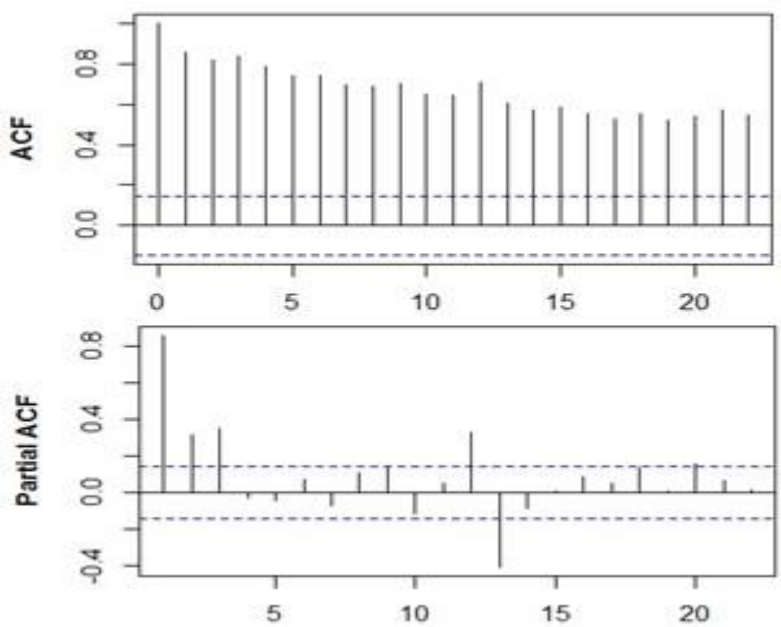

Fig. 4-3 Correlogram of Yt.

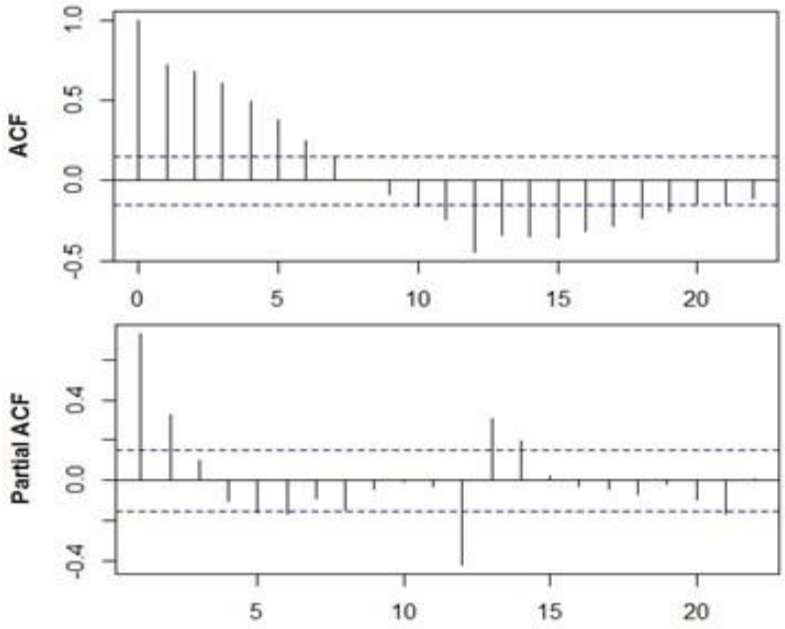

Fig. 4-4 Correlogram of DYt.

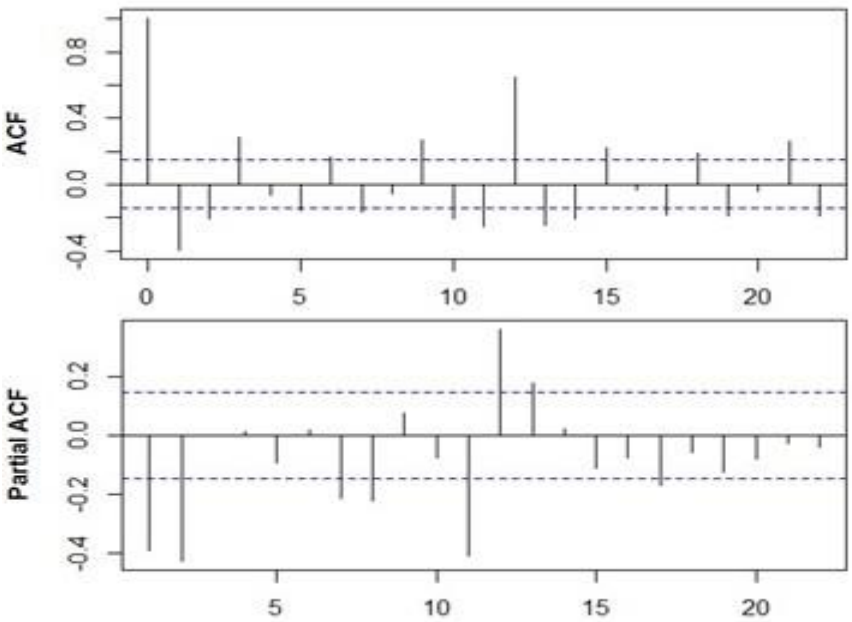

Fig. 4-5 Correlogram of D12DYt.

4.3.2 Estimation

The appropriate fitting model is decided by the ACF of the series in Figure 4-4. The ARIMA (0, 1, 3) $(0, 1, 1)_{12}$ model seems appropriate. The parameters of the tentative model are estimated by the method of least squares and the fitting model is given as follows:

$$(1-L)(1-L^{12})Y_t = (1-0.54L+0.17L^3) \times (1-0.87L^{12})\varepsilon_t \quad [6]$$

The tentative model is detailed in Table 4-2.

Table 4-2 Estimates of the fitted model

Parameter	Coefficient	t-Statistic	Prob.	Variable
θ_1	-0.535	-7.70	0.0000	MA(1)
θ_3	0.170	2.44	0.0157	MA(3)
θ_{12}	-0.872	-34.03	0.0000	SMA(12)

4.3.3 Diagnosis

There is no marginally significant spike at lag 1 and at seasonal lags in ACF and PACF plots for residuals of the tentative model. Ljung-Box Q-statistic test is applied to check whether residuals are white noise. At a lag of 20, the Q-statistic value is 13.313, which is much smaller than $X^2_{0.05}$ (20), which has a value of 31.410. Hence, we accept them as white noise and accept the fitted model for the time series.

4.3.4 Intervention hypothesis test

To avoid a priori and bias choice among models of impact, the general function that is hypothesized as equation 5 is applied to assume that the impact of the 2011 Great East Japan Earthquake is abrupt but temporary.

$$\mathbf{Y_t = \delta Y_{t-1} + \omega I_t + noise} \quad [7]$$

where I_t is defined as a pulse function:

$$I_t = \begin{cases} 1, \text{ in March 2011} \\ 0, \text{ otherwise} \end{cases}$$

The ARIMA (0, 1, 3) $(0, 1, 1)_{12}$ model for the full intervention model sample from January 1996 to February 2013 is estimated to test the impact of the earthquake, and so

transfer function parameters are estimated as follows:

$\delta = 0.194$ with t-statistic $= 1.15$
$\omega = -139642.2$ with t-statistic $= -4.16$

The parameter of ω is -139642.2 and is statistically significant, so the result infers that the 2011 Great East Japan Earthquake had an abrupt impact on inbound tourism demand, but the duration of the effect is not clear, because δ is not statistically significant. This means that the next step is to test the type of abrupt impact, i.e., is it constant or temporary?

In this case, another assumption is made that the impact is abrupt but constant and the transfer function model is specified as shown in equation 8.

$$\mathbf{Y_t = \omega I_t + noise} \qquad [8]$$

where I_t is defined as a pulse function as follows:

$$I_t = \begin{cases} 1, \text{ from March 2011} \\ 0, \text{ otherwise} \end{cases}$$

The ARIMA (0, 1, 3) $(0, 1, 1)_{12}$ model is applied again to estimate transfer function parameters, with the following results:

$\omega = 6946.71$ with t-statistic $= 1.06$

Parameter ω is positive and not statistically significant, so the result refuses the assumption that the impact is constant.

The results show that the Great East Japan Earthquake impacted abruptly but temporarily on inbound tourism demand.

Table 4-3 Identification, estimation and intervention hypothesis results

	Disasters	Relevant proposition	Identification	Estimation	C	Θ_1	Θ_{12}	Θ_3	$\emptyset_4$	ω	δ
Geological disasters	2003.5 Miyagi-Oki Earthquake	Case1	ARIMA (0,1,1) × $(0,1,1)_{12}$	Θ_1 =-0.691a(-6.68) Θ_{12} =-0.815a(-18.13)	N/A	-0.605a (-0.541)	0.467n.s. (0.76)	N/A	N/A	-43531.02n.s. (-1.16)	-0.404n.s. (-0.61)
	2003.9 Tokachi-Oki Earthquake	Case2	ARIMA (4,1,1) × $(0,1,1)_{12}$	$\emptyset_4$ =-0.470a(-3.55) Θ_1 =-0.664a(-7.50) Θ_{12} =-0.837a(-23.34)	N/A	-0.997a (-28.96)	-0.889a (-25.51)	N/A	-0.242a (-2.88)	17461.76a (3.24)	0.483a (4.58)
	2008.6 Iwate-Miyagi Nairiku Earthquake	Case3	ARIMA (0,1,1) × $(0,1,1)_{12}$	C=548.63(-3.39) Θ_1 =-0.767a(-13.73) Θ_{12} =-0.909a(-40.54)	556.27n.s. (1.026)	-0.336 (-2.29)	-0.874a (-35.64)	N/A	N/A	-64261.81b (-2.48)	-0.220n.s. (-1.48)
	2011.3 The Great East Japan Earthquake	Case4	ARIMA (0,1,3) × $(0,1,1)_{12}$	Θ_1 =-0.535a(-7.70) Θ_{12} =-0.872a(-34.03) Θ_3 =0.170b(2.44)		-0.531a (-3.42)	-0.892a (-42.19)	1.141c (1.91)	N/A	-139642.2a (-4.18)	0.194n.s. (0.25)
Extreme weather events	2000.9 Heavy Rainfall Disasters in Tokai District	Case5	ARIMA (0,1,1) × $(0,1,1)_{12}$	Θ_1 =-0.770a(-5.72) Θ_{12} =-0.817a(-4.05)	N/A	-0.538a (-3.56)	-0.839a (-17.25)	N/A	N/A	-13513.75n.s. (-0.95)	-0.287n.s. (-1.67)
	2005.1-2 Blizzard Tohoku	Case6	ARIMA (4,1,1) × $(0,1,1)_{12}$	$\emptyset_4$ =-0.255b(-2.47) Θ_1 =-0.572a(-6.51) Θ_{12} =-0.862(-28.98)	N/A	-0.741a (-7.11)	-0.867a (-32.91)	N/A	-0.18n.s. (-1.62)	16040.64b (2.17)	0.17n.s. (1.15)
	2006.11 Saroma Tornado	Case7	ARIMA (4,1,1) × $(0,1,1)_{12}$	C=531.44(2.07) $\emptyset_4$ =-0.229b(-2.36) Θ_1 =-0.667a(-9.13) Θ_{12} =-0.877(-35.48)	418.47a (3.89)	-0.906a (-19.35)	-0.891a (-34.46)	N/A	-0.115n.s. (-1.18)	11365.95n.s. (1.03)	0.210b (2.05)
	2008.3 Tornado in Kagoshima Prefecture	Case8	ARIMA (0,1,1) × $(0,1,1)_{12}$	c=523.25(3.09) Θ_1 =-0.765a(-13.55) Θ_{12} =-0.909a(-41.11)	460.02a (4.09)	-0.890a (-17.81)	-0.903a (-38.23)	N/A	N/A	5860.06n.s. (0.47)	0.200c (1.92)
Others	2001.9 The 9/11 attack	Case9	ARIMA (0,1,1) × $(0,1,1)_{12}$	Θ_1 =-0.998a(-30.22) Θ_{12} =-0.841a(-20.79)	N/A	-0.016n.s. (-0.05)	-0.837a (-24.92)	N/A	N/A	-27259.62n.s. (-1.25)	-0.309n.s. (-1.00)
	2003.4-6 SARS Pandemic	Case10	ARIMA (0,1,1) × $(0,1,1)_{12}$	Θ_1 =-0.829b(-12.65) Θ_{12} =-0.876a(-24.80)	N/A	0.004n.s. (0.017)	-0.829a (-26.89)	N/A	N/A	-39667.06b (-2.40)	-0.494b (-2.27)
	2008.9 Lehman Shock	Case11	ARIMA (0,1,1) × $(0,1,0)_{12}$	C=493.78(2.61) $\emptyset_4$ =-0.187b(-2.07) Θ_1 =-0.694a(-10.52) Θ_{12} =-0.888(-37.06)	622.27n.s. (1.22)	-0.384a (-2.78)	-0.880a (-32.80)	N/A	-0.009n.s. (-0.11)	-47644.21c (1.83)	-0.177c (-1.21)
	2009.5-6 Influenza Pandemic	Case12	ARIMA (4,1,1) × $(0,1,1)_{12}$	$\emptyset_4$ =-0.221b(-2.375) Θ_1 =-0.453a(-5.84) Θ_{12} =-0.866(-35.95)	N/A	-0.282c (-1.75)	-0.873a (-35.71)	N/A	-0.005n.s. (-0.05)	-51619.36b (-2.26)	-0.246n.s. (-1.56)

Note: Computed using Eviews 6.0. T-statistics values are given in parentheses. The superscript `a` means significance at 1%, superscript`b` means significance at 5%, and superscript `c`means significance at 10%. n.s. means not significant, N/A means not applicable.
`C`is constant.The Ø and Θ parameters are estimated for AR and MA individually. Θ_{12} parameter is estimated for SMA (12) .

4.4 Results

Based on the procedures determined above, Table 4-3 shows results of the intervention analysis. Because inbound tourist arrivals are characterized by seasonality, it is necessary to be clear about which the months of seasonality before the impact of disasters is analyzed. We found that the "on" seasons are April, July, August, October and December, whereas the "off" seasons are January, March, September and November, and otherwise are "shoulder" season for inbound tourist arrivals.

A testable implication of case 1 is that the May 26, 2003, Miyagi-Oki Earthquake, a Mw7.1 intra slab earthquake, did not impact significantly on inbound tourism demand because parameters ω and δ are not statistically significant. Based on the statistics provided by the Japan Meteorological Agency (JMA, 1996), the Miyagi-Oki Earthquake injured a total of 172 persons. The earthquake occurred during the "shoulder" season of inbound tourism and thus in the month that the earthquake occurred. This time was also in a period during a SARS epidemic, in which many people died of the disease. In other words, compared to the deadly SARS fatalities, the impact of the earthquake was not significant.

Results obtained from testing case 2 indicate that the September 26, 2003, Tokachi-Oki Earthquake (Mw 8.0) which was a subduction zone earthquake, and hit along the Kuril trench off Tokachi, Hokkaido, did not impact on inbound tourist arrivals, instead, it was found that the number of inbound tourist arrivals increased after the earthquake, according to parameters ω and δ, which are statistically significant at the 1% level, and the ω coefficient is positive. Though the earthquake caused 1 death, left 849 injured and 1 missing (JMA, 1996), it occurred in the "off" season for inbound tourism. During the month that the earthquake occurred, people were free from SARS and international tourism rebounded increasingly, which meant that the earthquake did not affect the recovery trends.

In case 3, Table 4-3 results imply that the June 14, 2008, Mw 7.2 Iwate-Miyagi Nairiku earthquake, an inland earthquake mainly striking the mid-Tohoku region, leaving 17 dead, 426 injured, and 6 missing (JMA, 1996), impacted abruptly on tourism demand because the ω coefficient is -58431.75, which is statistically significant at 5%. The duration of the effect cannot be determined, however, because δ is not statistically significant. To ascertain the duration of the impact, further intervention hypothesis testing was implemented, as was done with case 4. It was found that the impact duration was not gradual because the new ω coefficient is 3389.66, which is not statistically significant.

We concluded that the impact of the earthquake was abrupt but contemporary. Even though it occurred during a “shoulder” season for inbound tourism, it occurred inland and caused heavy casualties, so it may have impacted the tourism demand in the following months which were during the boom season.

A testable suggestion in case 4 is that the 2011 Mw 9.0 Great East Japan Earthquake impacted seriously but temporarily on tourism demand, killing 18,131 dead, injuring 6,194 injured, and leaving 2,829 missing (FDMA, 2012). It is also trigged serious tsunamis that also played a part in precipitating a nuclear meltdown incident at a local nuclear power plant. Although the earthquake was in the “off” season, the fears it inspired hit hard at inbound tourism demand.

Intervention analysis results for case 5 indicate that heavy rainfall disasters in the Tokai district in September 2000 did not impact significantly on inbound tourism demand. Even though the ω coefficient is negative, it is not statistically significant (Table 4-3).

For case 6, it was found that a blizzard in Tohoku did not negatively influence inbound tourism demand. Rather, to the contrary, tourist arrivals increased significantly, as indicated by the positive ω coefficient, which is also statistically significant as shown in Table 4-3. January and February are not part of the “on” season for inbound tourism; the heavy snow was to some extent a tourist attraction.

Empirical results for cases 7 and 8 showed that that the Saroma Tornado in November 2006 and the Tornado in Kagoshima in March 2008 did not significantly adversely affect tourism demand because the individual ω coefficients are not statistically significant.

Intervention analysis tests in case 9 showed that the 9/11 attacks on the new York Trade Center towers did not impact negatively or significantly on inbound tourism demand in Japan, partly because of their great distance from Japan and partly because Japan’s main tourist source is Asia. Moreover, Japan has a good reputation as one of the safest tourism destinations in the world.

A testable implication for case 10 is that the 2003 SARS pandemic had a negatively abrupt and temporary impact on inbound tourist arrivals, as the results shown in Table 4-3 indicate that both of the ω and δ coefficients are statistically significant and the parameter of ω is -39667.06. Although no death due to SARS occurred in Japan, the epidemic occurred during the boom season for inbound tourism to Japan and the most greatly affected area was Asia, especially China, Taiwan, and Hong Kong, which are the main sources of inbound tourists for Japan. International tourist arrivals thus declined indirectly but sharply due to SARS.

Empirical results for case 11 indicate that the Lehman Shock impacted adversely and abruptly on tourism demand as indicated by individual ω coefficients, which are significant (Table 4-3). The Lehman Shock, which began in September 2008, trigged a

worldwide economic crisis, spreading through the international tourism industry. Statistics showed that international tourist arrivals declined 4% in 2009 over those in 2008. Japan, as one country among international tourism destinations, was adversely impacted on by the financial crisis.

For case 12, results in Table 4-3 indicate that the May and June 2009 influenza pandemic negatively and abruptly influenced inbound tourist arrivals because the ω coefficient is statistically significant at a value of -51619.36. The δ coefficient was not significant, so to determine the duration of the impact, further testing such as that conducted in cases 3 and 4 was required. Results showed that the new ω coefficient was not statically significant. We therefore concluded that the 2009 influenza pandemic had an abrupt but temporary impact on inbound tourism demand in Japan.

4.5 Conclusion

In this chapter, we have applied ARIMA intervention analysis in evaluating the impact of disasters on inbound tourism demand in Japan and have examined patterns of disasters influencing tourism demand significantly. Empirical results have shown that (1) International tourism demand for Japan was really impacted on by great disasters, especially by infectious disease pandemics and earthquakes. (2) Not all disasters resulted in an abrupt drop in inbound tourist arrivals. Extreme weather events, for example, did not hit inbound tourism demand significantly and negatively. (3) Impact caused by disasters was temporary.

Based on results in Table 3, for the disaster period from 1996 to 2011, the 2011 Great East Japan Earthquake impacted the most severely on tourism demand. Its impact was underscored by the 2008 Iwate-Miyagi Nairiku earthquake, the 2009 Influenza pandemic, the Lehman Shock, and the 2003 SARS pandemic. These empirical results agree with the impact of the global shock to worldwide international tourist arrivals that the economic crisis had, bringing on the worst decline, followed by SARS and the 9/11 World Trade Center attacks. Weather patterns at Japan's main source destinations are similar to Japan's and extreme weather events in general are predictable and short, so extreme weather events did not impact seriously on tourism demand. Disasters negatively affecting inbound tourism demand in Japan had, however, only a temporary impact.

This section has pinpointed and assessed the impact of disasters on inbound tourist arrivals in Japan. Providing references to policymakers in the tourism industry in ways that we hope will enable them to better understand main shocks impacting adversely on Japan's inbound tourism demand. More importantly, findings in this chapter may provide

useful insights to those in tourism planning and crisis management and thereby help the industry to prepare for disasters.

This chapter has been limited to investigating the impact of major disasters occurring between January 1996 and March 2011 on inbound tourist arrivals. It provides overall references to managers about the impact of disasters on the tourism industry, but has not sought to discuss the impact on the tourism business itself (Tanabe et al. 2012), and offer strategies that may help others respond to disasters. It would have been interesting to compare differences in impact between inbound tourist arrivals and the number of domestic tourists, but this work cannot be achieved as the data on domestic tourists was unavailable when this paper was written.

The tourism industry has become more susceptible to disasters, crises, and shock events (Faulkner, 2001; King, 2002). Based on the empirical analysis presented in this chapter, the destructive effects of large earthquakes, economic crises and infectious disease epidemics on inbound tourism demand are clearly evident. With large-scale earthquakes expected to occur in Japan in the near future, the Tokai-Tonankai-Nankai Earthquake, for example, has a 50-60% possibility of occurring within 30 years (Maki et al. 2008). Future research will need to determine how to prepare for major disasters that impact heavily on inbound tourism demand, especially huge earthquakes. Business Continuity Plan (BCP), which is an important component of crisis management plan, may be a good alternative and much of the literature has focused on disaster preparedness for business continuity (Urakawa and Hayashi, 2010).

4.6 Discussion

Not all disasters significantly impact tourist flow, for example heavy rain. Huge earthquakes most significantly impacted tourism demand. Tourists are most considered about safety and security. It is hoped that this chapter would make researchers and policy makers in destinations better understanding of huge earthquakes' impact and then pay more attention to earthquake disasters. Meanwhile, some issues are proposed, such as how tourism destination, mainly tourism organizations and tourism sectors prepare for the predicted huge earthquakes, which would happen in near future in Japan, and whether they have consider measures to protect tourists from earthquake disasters.

Special earthquake disaster preparedness is required for earthquake-prone countries, such as Japan and China. Until now, by reviewing literature in tourism and disaster study, there is few such research specifically targeted for earthquake disaster. Though the results indicate that past disasters impacted tourism demand temporarily, rather than

permanently, temporary may also cause large loss. It is suggested that tourism destinations should consider how to explore short term effective strategies from demand and supply.

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Chapter 5 Analysis of tourist perception and attitude toward disasters: Case study on recent large-scale earthquake disasters in China

5.1 Objectives

Since 2008, Sichuan Province, China experienced two large earthquakes; the 2008 Wenchuan Earthquake and the 2013 Ya'an earthquake (see Figure 5-1). The 2008 Wenchuan Earthquake that occurred on May 12 at 06:28 (UTC) in Sichuan Province, had a magnitude of 8.0 on the Richer Scale and caused considerable loss of casualties, including 69,195 dead, 374,177 injured and 18,392 missing (Chinanews, 2008). The Ya'an earthquake of 7.0 on the Richer Scale, also hit Sichuan on April 20, 2013. According to official statistics (China.com, 2013) the earthquake resulted in 196 people dead, 21 missing, and 11,470 injured. The earthquakes caused a large number of buildings and infrastructures ruined, highways, water supply and power systems destroyed or affected, and a vast amount of sewage and garbage generated. The earthquakes significantly affected all industries, including the tourism industry, in the areas in which they struck. Figure 5-2 show the Inbound and domestic tourists in Sichuan between Dec. 2004 and Apr. 2010.

a. 2008 Wenchuan earthquake b. 2013 Ya'an earthquake

Fig. 5-1 Main earthquakes in Sichuan. (Source: Wiki, 2008 and 2013)

Risk has been widely discussed in the existing literature, including tourism research. People commonly travel for recreation, leisure, business, visiting friends and relatives, and so on. In exceptional cases, travelers journey in the interest of taking risk. The individual's safety and security needs take dominate and precedence behavior when one's physical needs relatively satisfied (Maslow, 1943). Personal safety factor appears to be one of the most critical factors for tourist choice of destination (Hsu et al., 2009).

The tourism industry is vulnerable to a series of disasters, because it is a compressive industry and depends on so many components and individual businesses; more importantly, disasters may endanger the safety of visitors (Sönmez, 1998). Because safety and security are essential conditions for the development of tourism, they are fundamental determinants of 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 (Sönmez et al., 1999). In addition, tourists are often more vulnerable than locals in disaster situations because they are less familiar with local hazards and the resources on which they can rely on to avoid risk, and they are less independent (Burby and Wagner, 1996; Drabek, 1992, 1995; Faulkner, 2001). An abundant of studies indicated that the tourism industry was negatively and significantly affected by shocks. Examples of these shocks include the 2001 foot and mouth crisis (Sharpley, 2001; Thompson, 2002), the September 11 terrorist attacks (Goodrich, 2002; Floyd et al., 2004; Ito and Lee, 2005), Severe Acute Respiratory Syndrome (SARS) (Chien and Law, 2003; Wilder-Smith, 2006), the Indian Ocean tsunami (Henderson, 2005; Birkland et al., 2006), and earthquakes (Mazzocchi and Montini, 2001; Huang and Min, 2002; Yang et al, 2008; Mendoza et al., 2012; Wu and Hayashi, 2013).

Existing research on tourism disasters primarily focused on assessment the impact of disasters on tourism and tourism disaster management. However, to date, relatively little research has been conducted on tourists' perception of risk. Among these studies, the majority concentrated on international travelers' perception of risk and a few discussed domestic tourists' perception. A limited understanding exists of the relationship among tourist's risk perception, travel motivation, the impact of perceived disasters and tourist satisfaction. This chapter[3] centers on domestic perception after the two earthquakes in Sichuan. Specifically, this exploratory investigation draws from a sample of domestic travelers to examine tourists' attitude toward the impact of disasters on tourism

[3] This chapter is based on the following reviewed paper.

Wu, L.H. and Hayashi, H., An Analysis of Tourist Perception and Attitude towards Disasters: A Case Study of Recent Chinese Large Earthquake Disasters, Journal of Institute of Social Safety Science, No.24, pp. 311-320, 2014.

destinations. This chapter uses SEM approach to explore the inter-relationship among risk perception, travel motivation, attitude toward the earthquakes' impact on tourism in Sichuan (AEITS), and tourist satisfaction. The outcomes of this chapter are expected to contribute to the tourism industry by providing knowledge of tourists' risk perception and their attitude toward earthquakes' impact on tourism, and then by improving planning for future crisis management.

5.2 Study sites

Since 2008, Sichuan Province, China experienced two large earthquakes, the 2008 Wenchuan Earthquake and the 2013 Ya'an earthquake. The earthquakes caused a large number of buildings and infrastructures ruined, highways, water supply and power systems destroyed or affected, and a vast amount of sewage and garbage. Chengdu was selected as a survey location because it is the traffic hub of Sichuan Province even southwest in China, is the provincial capital of Sichuan, and is located in the intermediate zone of the main quake-hit areas (see Figure 5-1).

Figure 5-2 indicates the AAAAA scenic spots (until August 2013) in Sichuan (Sichuan provincial tourism administration, 2013). Mount Qingcheng-Dujiangyan, one of the most famous scenic spots in Sichuan, is near the epicenter of the main quake of the 2008 Wenchuan Earthquake. Therefore, Dujiangyan was selected as the other study survey site.

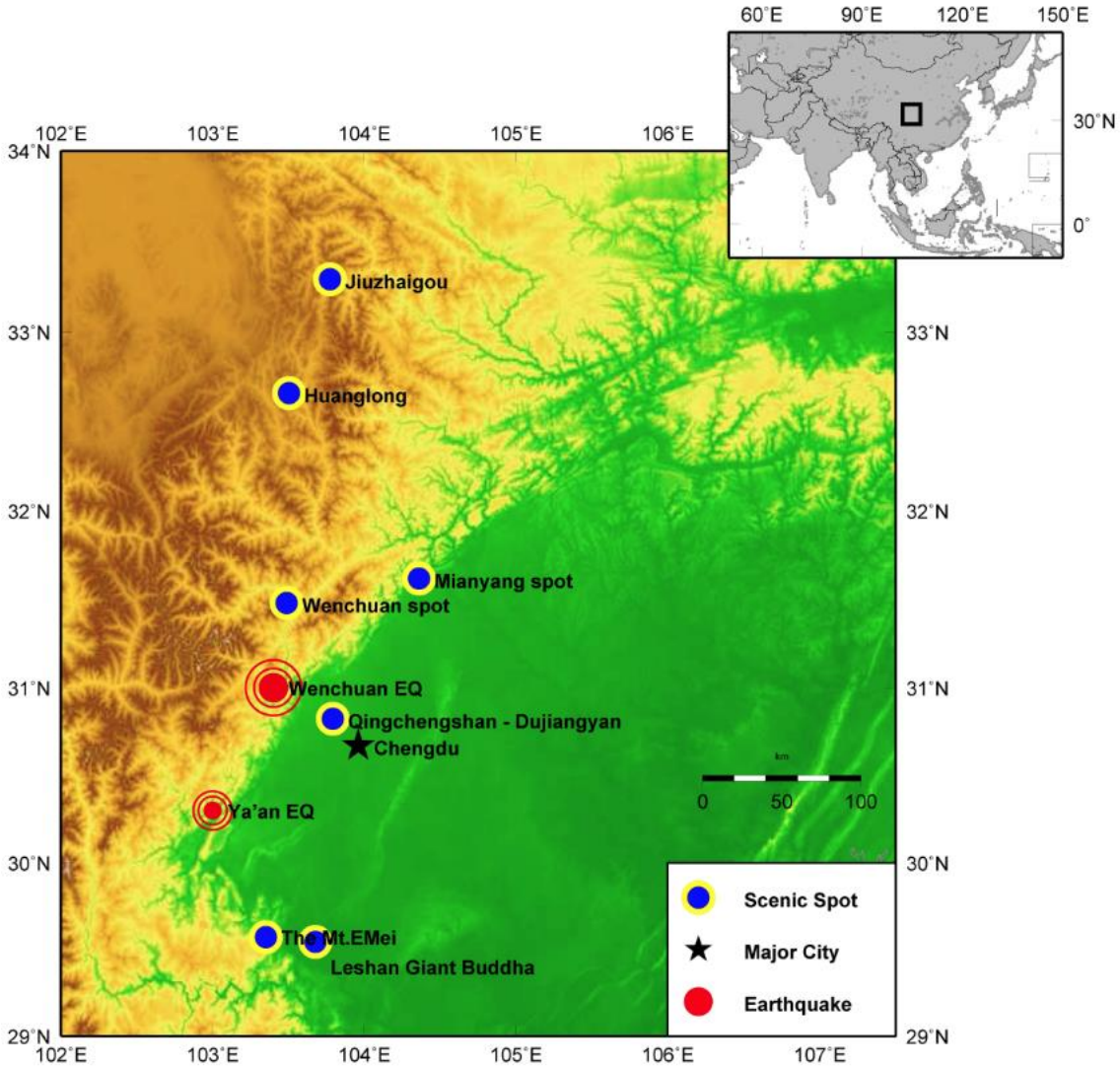

Fig. 5-2 The distribution of main scenic spots in Sichuan.

5.3 Data and Method

5.3.1 Data

The data for this study were collected using a questionnaire given to domestic tourists in Sichuan. Visitors who were traveling in Chengdu (Jinli Street, Kuan-Zhai Lane, Chunxi Road, Tianfu Square) and Dujiangyan (Mount Qingcheng, Hongkou) were randomly invited to fill in the questionnaire with the assistance of local students. The survey was conducted in August 2013, soon after the 2013 Ya'an earthquake.

Based on the purpose mentioned above, we targeted tourists traveling in the two survey sites. After the survey, 412 out of the total sample of 550 were found to be valid for further data analysis. The demographic variables were selected on the basis of the literature

review included gender, age, education level, monthly income level and residence. The sample demographic profile shown in Table 1 is deemed a representative sample. Respondents' age distribution was from younger than 18 to older than 66, with the majority in the 18–25 (35%) and 26–35 (24.8%) age groups, given that August is summer vocation for students in China. The respondents were highly educated, with 56.8% undergraduates and 17.2% technical or vocational college students, which were consistent with age variables. Table 1 shows that more than half (53.2%) of the respondents had a monthly income of RMB 1,500–2,500. The vast majority of the respondents were from Southwest China (86.4%) in accordance with the official government statistics in Sichuan Province that the majority tourists were from Sichuan or nearby provinces. More than 50% of the respondents indicated that that were "sightseeing," and "growth of knowledge" accounted for more than 45% of the responses.

Table 5-1 Demographic profile of respondents

Varibale	n	Percent（%）
Gender		
Male	180	43.7
Female	232	56.3
Age		
Under 18	47	11.4
18-25	144	35.0
26-35	102	24.8
36-45	48	11.7
46-55	25	6.1
56-65	26	6.3
66 or above	20	4.9
Education		
less than Senior high school	33	8.0
Senior high school	68	16.5
Technical/vocational college	71	17.2
Undergraduate	234	56.8
postgraduate	6	1.5
Monthly income level		
Less than RMB 1500	82	19.9
RMB 1500-2500	219	53.2
RMB 2501-3500	98	23.8
RMB 3501-5000	10	2.4
RMB 5001 or above	3	0.7
Residence		
North China	5	1.2
Northeast China	1	0.2
East China	7	1.7
South China	28	6.8
Southwest China	356	86.4
Northwest China	8	1.9
Central China	7	1.7

5.3.2 Method

5.3.2.1 The hypothesized structural model

In recent years, there has been an increasing interest in discussing the impact of actual and potential threats, such as terrorism, earthquakes, epidemics and tsunamis on tourism industry. Faulkner (2001) [11)] noted that we are living in an increasingly disasters prone world. This standpoint was based on the number of disasters has increased in recent decades, and the media report these events causally. Tasci and Gartner (2007) indicated that human caused disasters and natural disasters reported by the media have an even more significant impact on the image of a tourist destination. This image is regarded as an important aspect of successful tourism development and destination marketing given its impact on both the supply and demand sides of marketing. Destination image formation factors comprise supply side, independent side, and demand side. Among them, only demand side is uncontrollable and refers to socio-demographics, psychographics, motivations, experience and prior visit, attitude, and needs (Tousi et al., 2012).

(1) Risk

Risk is defined by UNISDR (2007) as the combination of the probability of an event and its negative consequences. The definition includes two distinguishing connotations: in popular usage the emphasis is usually placed on the chance of possibility, whereas in a technical setting the emphasis is frequently on the consequences. This chapter focused on the popular usage. In the marketing literature, Bauer (1960) introduced the construct of perceived risk. This concept is frequently used by consumer researchers to define risk in terms of the consumer's perceptions of both uncertainty and magnitude of the possible adverse consequences (Yüksel and Yüksel, 2007).

Tourists perceive different types of risk and/or a combination of these risks, which make tourists perceive a global level of risk (Park and Reisinger, 2010). Roehl and Fesenmaier (1992) identified three dimensions of the perceived risk and divided travel risks into seven categories: equipment risk, financial risk, physical risk, psychological risk, satisfaction risk, social risk and time risk. Sönmez and Graefe (1998) summarized previous achievements and categorized four main types of risk as associated with tourism, namely, financial, psychological, satisfaction, and time risks. Lepp and Gibson (2003) noted that safety and security were important concerns for tourists and underlined four major risk factors: terrorism, war and political instability, health concerns and crime. Although different researchers classified risk differently, this chapter focused on health (Pine and McKercher, 2004; Kuo et al., 2008), terrorism (Enders et al., 1992), and natural disasters, including catastrophes and general disasters (Milo and Yoder, 1991; Lo et al., 2001). These four factors were measured on the basis of the magnitude of the threat and

the probability of occurrence, which impacted attitude and behavioral changes (Rogers, 1975).

(2) Travel motivation

Motivation is a critical part of travel consumer behavior. Several theories have been developed regarding travel motivation, such as the push-pull theory (Dann, 1977) and Iso Ahola's Motivational Theory (Iso-Ahola, 1982; Mackellar, 2013). Yet, little academic research has investigated disaster management for tourism (Rittichainuwat, 2006) or the relationships among motivation and other behavioral constructs (Yoon and Uysal, 2005; Hsu et al., 2010). Rittichainuwat (2008) investigated the travel motivation of tourists visiting disaster-hit beach resorts. Yoon and Uysal (2005) empirically tested the causal relationships among motivation, satisfaction, and destination loyalty. The motivation factor is included in this chapter as a latent variable.

(3) Attitude

Attitude consists of one's beliefs about the consequences of performing a behavior multiplied by his or her valuation of these consequences (Fishbein and Ajzen, 1975). Gnoth (1997) suggested that attitudes are the first topic of discussion in the development of a model for tourism motivation and behavior, and specified the relationship between motivation and attitude. According to the existing literature (Gnoth, 1997; Hsu et al., 2010; Wong et al., 2013), attitude toward visiting a destination is directly affected by motivation. Dunn Ross and Iso-Ahola (1991) explored the motivation and satisfaction dimensions of sightseeing tourists and indicated that a considerable similarity between attitude and satisfaction. Therefore, attitude factors are considered in this chapter.

(4) Satisfaction

A large volume of research discussed satisfaction and its determinant, including for the tourism field (e.g. Dmitrovic et al., 2009; del Bosque and Martín, 2008; Armario, 2008). Although multi-item scales are most commonly used to measure satisfaction, single-item measures of satisfaction have been used in existing literature, i.e. job satisfaction (Wanous and Reichers, 1996; Nagy, 2002), work satisfaction (Gardner et al. 1998), citizen satisfaction (Van Ryzin, 2004), and customer satisfaction (Fornell, 1992; Andreasen, 1984; Spreng and Mackoy, 1996; Spreng et al., 1996; Bolton and Lemon, 1999; Crosby and Taylor, 1982; Fornell et al.,1996; Herberlein et al., 1982; Tse and Wilton, 1988). In this chapter, we treated tourist satisfaction as a perfect measure and measured it with a single item, in accordance with prior research in this field (Bigné et al., 2001; Armario, 2008).

Many other factors, such as expectation (Hsu et al., 2010), service quality (Bigné et al., 2001), were studied. They were found to relate to the variables in our study. On the basis of the purpose of this chapter and to simplify the model, we focused on risk

perception, travel motivation, attitude, and satisfaction.

Figure 5-3 displays the hypothetical structural model, in which each component was selected on the basis of the literature review. The hypothesized reciprocal relationship between risk perception and travel motivation was referred to research by Reisinger and Mavondo (2005) and Chon (1989). The topics of motivation, attitude, perception, and satisfaction were diffusely discussed in the field of consumer behavior of marketing and psychology. Previous studies revealed that attitude was affected by perception (Um and

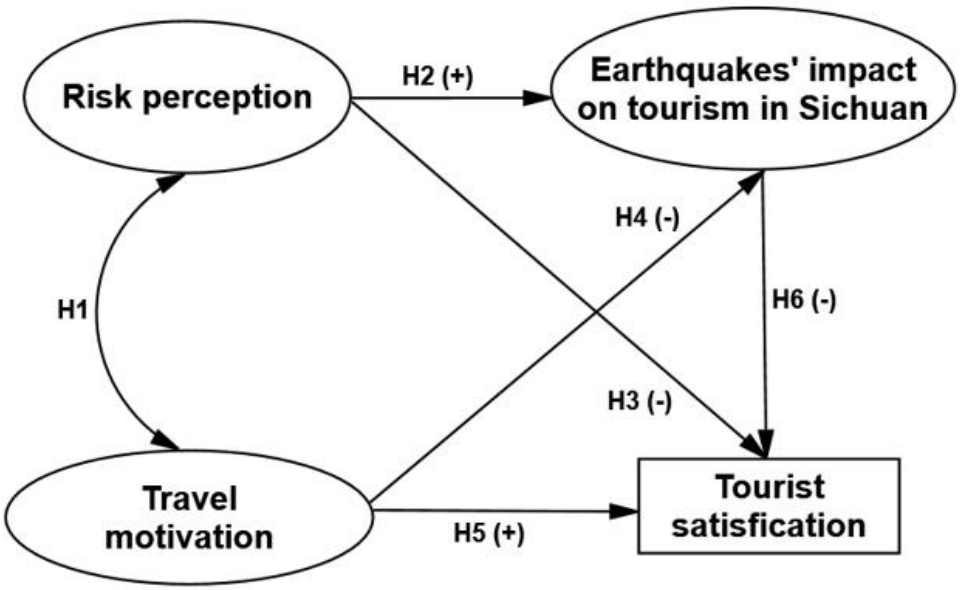

Fig. 5-3 The hypothesized structural model.

Crompton, 1990; Quintal et al., 2010) and motivation (Gnoth, 1997; Hsu et al., 2010; Wong et al., 2013), and satisfaction is affected by attitude (Chon, 1989), motivation (Dunn Ross and Iso-Ahola, 1991; Fielding et al., 1992; Yoon and Uysal, 2005) and perception (Churchill and Surprenant, 1982; Alegre and Cladera, 2009). Based on the literature, it is hypothesized that:

H1: Tourist risk perception is correlated with travel motivation.

H2: Risk perception is positively related to AEITS. Greater risk perception is associated with more significant impacts of the earthquakes.

H3: Risk perception is negatively related to tourist satisfaction. Greater risk perception is associated with lower satisfaction.

H4: Travel motivation is negatively related to AEITS. Stronger motivation to travel in Sichuan is associated with less earthquake damage.

H5: Travel motivation is positively related to tourist satisfaction. More strongly, travel motivation is associated with greater satisfaction.

H6: The perceived impact of earthquakes on tourism is negatively related to tourist

satisfaction. Tourist opinion that earthquakes cause greater damage results in lower satisfaction.

5.3.2.2 Questionnaire design and research variables

The items in this chapter primarily originated from a review of the empirical literature, as did the risk perception items (Law, 2006; Kozak et al., 2007). The items for travel motivation were derived from the studies by Rittichainuwat (2006 and 2008). The AEITS items primarily arose from Gan et al. (2010) and Li et al. (2011) (see Table 5-2).

Respondents were first asked questions on demographics, including gender, age, education level, monthly income level and residence. As shown in Table 2, the items of risk perception, travel motivation, and AEITS were measured using a five-point Likert type scale on the basis of what they thought of the items. Risk perception was measured using eight items, through which likelihood of the perceived risks was assigned values ranging from 1 = very low to 5 = very high, and the damage from the risks was scaled using little–huge high format. Travel motivation assessed using 13 items, the AEITS was measured by five items, and satisfaction level was directly assessed on a Likert scale from 1 = strongly disagree to 5 = strongly agree.

5.3.2.3 Structural equation modeling

Table 5-2 Latent and observed variables

Latent Variable	Observed Variable
Travel Motivation (13)	beauty of nature
	good climate
	attracting culture
	a variety of foods
	high quality of hotels and attractions
	high quality of service
	friendness of local people
	low-cost of travel
	safe travel in Sichuan
	convenient tranportation
	help the recovery of tourism industry
	curiosity about the debris after the disaster
	curiosity to see the recovery and change
Risk Perception (8)	the probability of pandemic diseases
	the probability of terrorism
	the damage of pandemic diseases
	the damage of terrorism
	the probability of catastrophies
	the probability of natual disasters
	the damage of catastrophies
	the damage of natual disasters
Attitude towards the Earthquakes' impact on tourism in Sichuan(5)	make journey dangerous
	environment became fragile
	tourism resources was destroyed significantly
	the number of tourist arrivals decreased
	tourism transportation was impacted heavily
Tourist satisfaction (1)	satisfaction

SEM is a statistical methodology that takes a confirmatory (i.e., hypothesis-testing) approach to analyzing a structural theory bearing on some phenomenon (Byrne, 2013). SEM represents an extension of general linear modeling (GLM) procedures, such as regression analysis and analysis of variance. More importantly, compared with other applications of GLM, SEM can be used to study the relationships among latent constructs that are indicated by multiple measures (Lei and Wu, 2007). SEM had not been frequently applied in the tourism disciplines (Reisinger and Turner, 1999), but its use in constructing predictive conceptual relations in the field of tourism has been increasing (e.g., Alegre and Cladera, 2009). Generally, structural equation model comprises two sub-models: a measurement model that defines relations between the observed and latent variables, and a structural model that represents the relations among the latent variables (Byrne, 2013). General steps in SEM are model specification, identification, estimation, testing the model fit, and model modification.

Table 5-3 The latent and observed variables for model estimation

Latent Variable	Common Factor	Label	Observed Variable
Travel Motivation(11)	natural and human factor	x1	beauty of nature
		x2	good climate
		x3	attracting culture
		x4	a variety of foods
	value for money and service	x5	high quality of hotels and attractions
		x6	high quality of service
		x7	friendness of local people
		x8	low-cost of travel
	curiosity and earthquake help	x9	help the recovery of tourism industry
		x10	curiosity about the debris after the disaster
		x11	curiosity to see the recovery and change
Risk Perception(8)	man made disaster	x12	the probability of pandemic diseases
		x13	the probability of terrorism
		x14	the damage of pandemic diseases
		x15	the damage of terrorism
	natrual disaster	x16	the probability of catastrophies
		x17	the probability of natual disasters
		x18	the damage of catastrophies
		x19	the damage of natual disasters
Attitude towards the Earthquakes' impact on tourism in Sichuan(5)		x20	make journey dangerous
		x21	environment became fragile
		x22	tourism resources was destroyed significantly
		x23	the number of tourist arrivals decreased
		x24	tourism transportation was impacted heavily
Tourist satisfaction(1)		x25	satisfaction

In this chapter, the observed variables were described using the scale items (27 items) and the latent variables were represented by the four dimensions of travel motivation, risk perception, AEITS and satisfaction (see Table 5-3). The maximum likelihood method of estimation was applied to estimate all of the models. Analysis of moment structures (Amos) Ver.22.0 was employed to perform the SEM. All reported results in this chapter were based on completely standardized solutions.

5.4 Data analysis and results

5.4.1 Descriptive analysis

5.4.1.1 Purpose of travel

Among the sample, over 200 respondents said they went for the study sites for "sightseeing", and the option of "growth of knowledge" accounted for more than 150 (33.3%), shown in Figure 5-4. Therefore most of them had no specific aims with which they have to travel to Sichuan. They mainly wanted to see more than what can see in their usual environment.

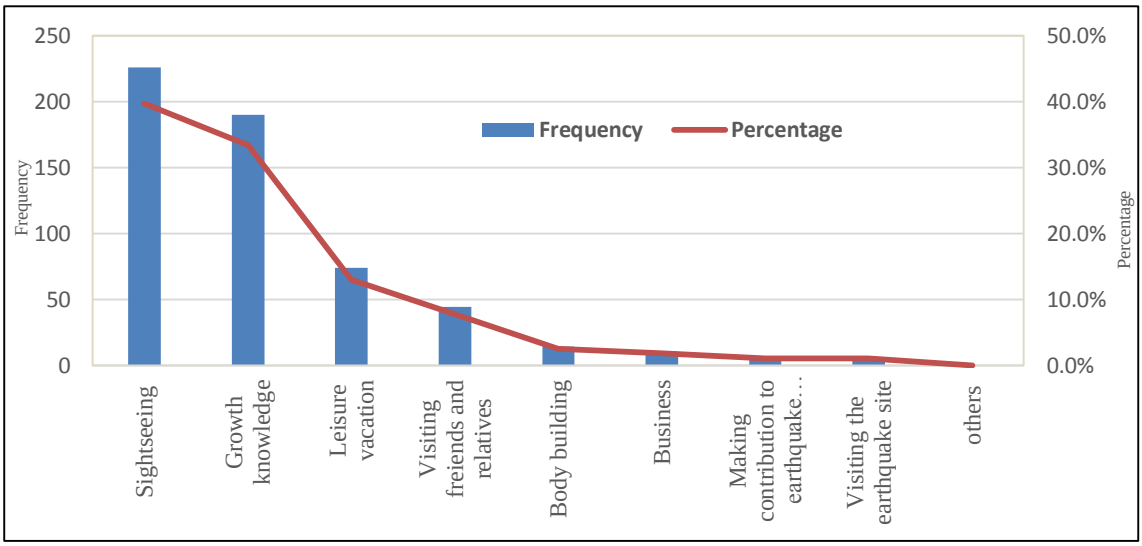

Fig. 5-4 Purpose of travel.

5.4.1.2 Future behavior

When it concerns to the question of "what attitude they held towards traveling in Sichuan in future", 344 respondents chose "I will recommend Sichuan as tourist destination to my relatives, friends or colleagues." said they would recommend their friends or relatives to travel in Sichuan, and the answer of "I will come to Sichuan for travel again" is 44 (Figure 5-5). Also 12 visitors chose "I will not come to Sichuan for

travel in short term" and one tourist choose "I will not come to Sichuan for traveling anymore."

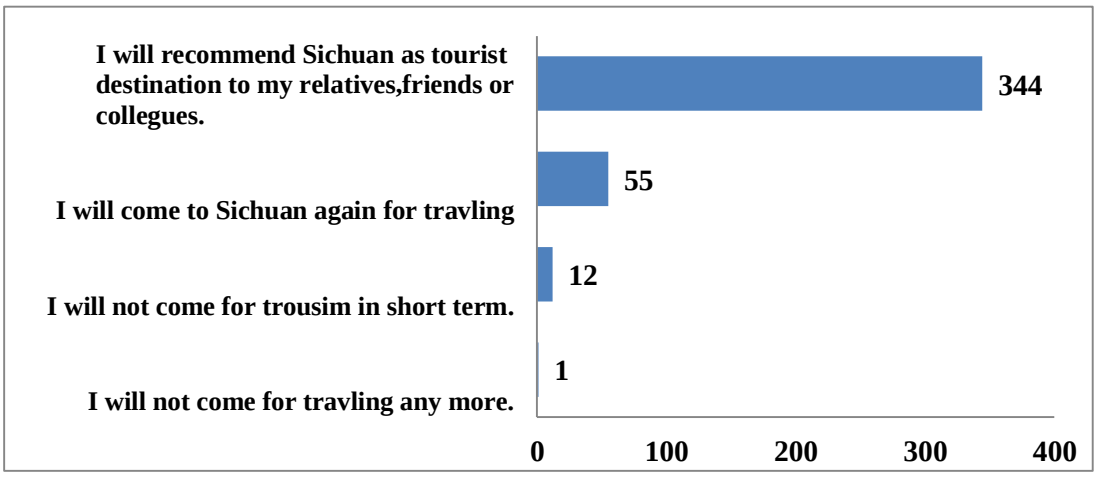

Fig. 5-5 Tourist behavior choice in future.

5.4.1.3 Others

It was also found that the 46.8% of the respondents thought that in order to get recovered from the disasters or obtain competitive advantage for tourism in Sichuan, they suggested developing earthquake relic parks, followed by the strategy to provide a better service (Table 5-4).

Table 5-4 Strategies for tourism recovery or tourism development of Sichuan

Strategies	Frequency	Percentage
Price promotion	119	28.9%
To develop earthquake relic parks	193	46.8%
To provide a better service	160	38.8%
To strengthen the security of infrastructure	48	11.7%

The majority of tourists thought that they mainly got tourism information from their relatives, friends or colleagues, with 58.9% of the respondents (See Figure 5-6).

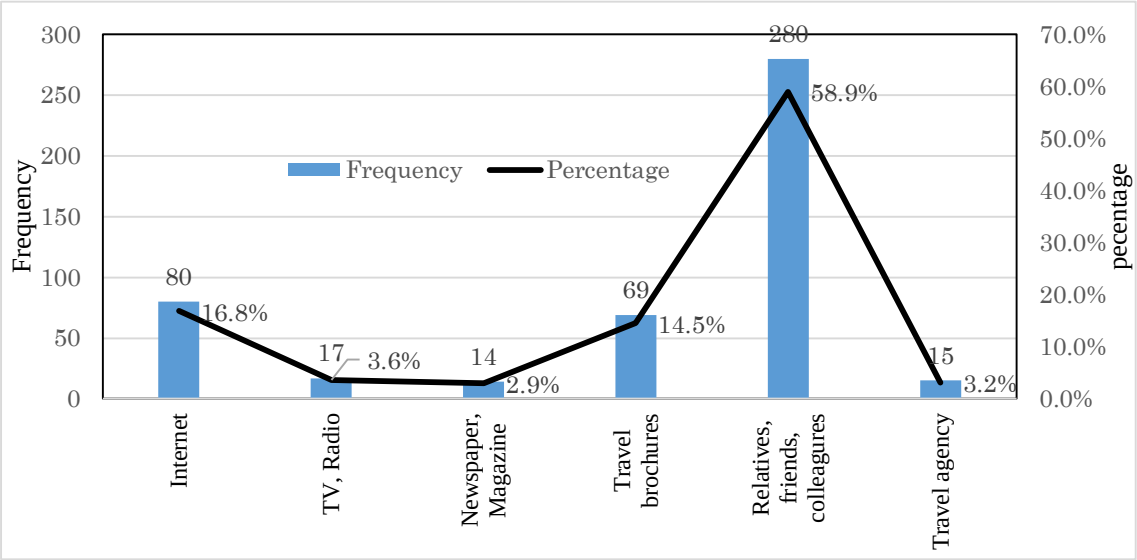

Fig. 5-6 Information resource for traveling in the study sites.

5.4.2 Structural equation modeling analysis

Data analysis in this part was accomplished in three steps. In the first step, a reliability analysis using Cronbach's alpha (1951) was performed for "risk perception", "travel motivation" and "AEITS" by applying SPSS 17.0 to verify the consistency and stability, resulting in α of 0.903, 0.957 and 0.983, respectively. All of these values are reliable given that an alpha value of 0.7 or higher is acceptable as a good indication of reliability (Nunnally, 1978). Next, with the aim of simplifying the measurement model, factor analysis was used for "risk perception", "travel motivation" to extract the factors to determine the correlations among the observed variables. The results are shown in Table 5-3. Factor analysis of the 13 travel motivation items resulted in three significant factors that explained 90.5% of the total variance. The variables of "safe travel in Sichuan" and "convenient transportation" were eliminated because they poorly measured the factors. Figure 5-6 shows the simplified measurement models for "risk perception", "travel motivation", in which the ellipses represent latent variables, the rectangles denote observed variables, and the circle indicated measurement errors.

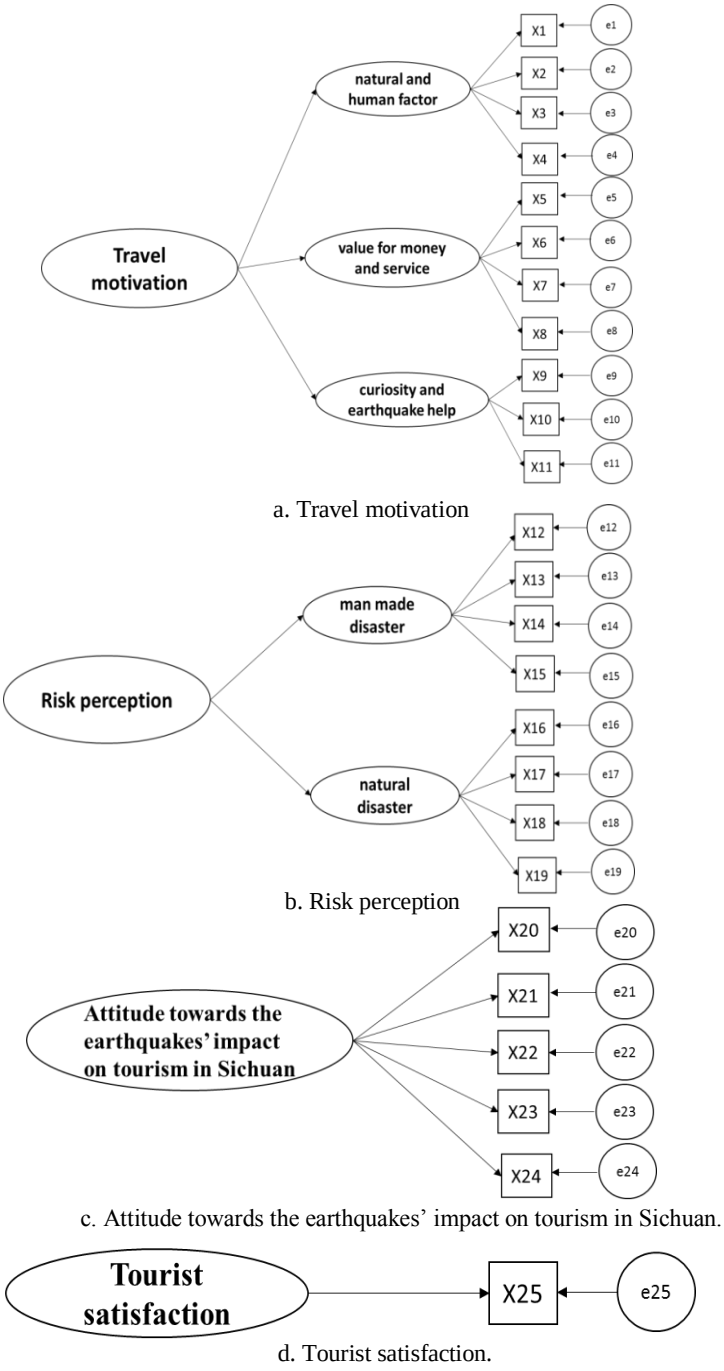

Fig. 5-7 The simplified measurement models.

Then, the confirmatory factor analysis (CFA) and SEM were employed to test the hypothesized model with the properties of the four variables (two exogenous and two endogenous). And in this step, the first factor loadings for each latent variable are set to 1 for model identification (UCLA Online; Milfont and Fischer, 2010), as shown in Figure 5-7, in which "e" and "r" are error terms. Because tourist satisfaction was measured using a single–item measure, David Kenny (2012) suggested the conditions for single-indicator

latent variables and indicated that single indicators meet either of the following conditions: a. its error variance is fixed to zero or some other a priori value or b. there is a variable that can serve as an instrumental variable in the structural model and the error in the indicator is not correlated with that instrumental variable. We applied the former rule suggested by David Kenny and set the error variance of tourist satisfaction to zero.

First, the chi-square test statistics were applied for hypothesis testing to evaluate the fit of the SEMs. For a good model fit, the ratio χ^2/degrees of freedom should be as small as possible. Because no absolute standards exist, a ratio between 2 and 3 is indicative of a "good" or acceptable data model fit, respectively. The usual rule of thumb for the goodness-of-fit index (GFI) is that 0.95 is indicative of a good fit relative to the baseline model, whereas values greater than 0.90 are usually interpreted as acceptable fits. A rule of thumb for Comparative fit index (CFI) is that 0.97 is indicative of a good fit relative to the independence model, whereas values greater than 0.95 may indicate as an acceptable fit (Schermelleh-Engel et al., 2003). Generally, the value for the root mean square error of approximation (RMSEA) should be less than 0.05. Hu and Bentler (1992) suggested a RMSEA of less than 0.06 as a cutoff criterion.

As Table 5-5 shows, the results for testing the hypothesized model exhibited poor model fit: Chi-square (χ2,CMIN) = 1,134.9, degrees of freedom (DF) = 265, CMIN/DF = 4.3, $P < 0.05$, GFI = 0.825, RMSEA = 0.089, and CFI = 0.944. Because the indices indicated a poor fit, post-hoc modifications were applied in an attempt to develop a better fitting model. All regression weights for the hypothesized structural model estimation were within acceptable ranges (p-value was set at the 5% significance level), with the exception of two regression paths: travel motivation → tourist satisfaction, risk perception → tourist satisfaction. Therefore, these two paths were deleted and a modified model 1 was achieved. The output shown in Table 5-5 indicates that the modified model 1 was still a bad fit, with χ2 = 1,138 (DF = 267, χ2/DF = 4.3), $p < 0.05$, GFI = 0.0824, RMSEA = 0.089, and GFI = 0.944. Examination of the modification indices (MI) revealed evidence of misfit in the model and suggested that allowing a number of error terms to correlate would improve the fit of modified model 1. Given that the values of MI and par change, and the maximum contribution to the model improvement fit, ten measurement errors were added and a new revised model, modified model 2, was obtained (see Figure 5-8). A chi-square difference test indicated that the modified model 2 was significantly improved by the addition of the error items with a ratio of χ2 equals to 2.3 at the 1% significance level. The value of GFI equals to 0.900 and RMSEA is 0.056, within acceptable fit level. CFI is 0.979, which is regarded as a good. Therefore, the model revision resulted in an improved and acceptable model, as demonstrated in Table 5-5.

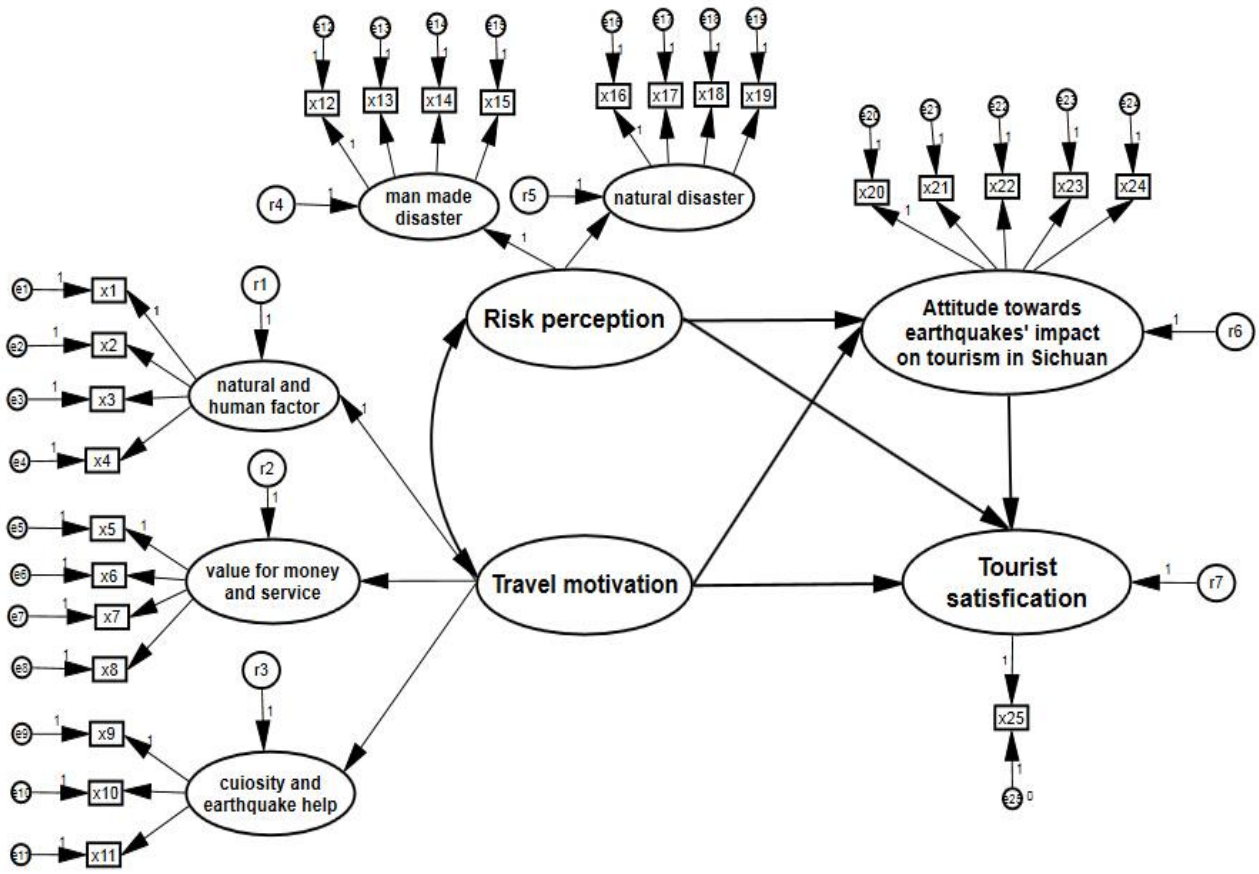

Fig. 5-8 Initial model.

Table 5-5 Goodness-of –fit measures

Model	CMIN	DF	CMIN/DF	P-value	GFI	RMSEA	CFI
Initial model	**1134.9**	**265**	**4.3**	**.000**	**0.825**	**0.089**	**0.944**
Modified model 1	**1138.0**	**267**	**4.3**	**.000**	**0.824**	**0.089**	**0.944**
Modified model 2	**585.3**	**257**	**2.3**	**.000**	**0.900**	**0.056**	**0.979**

Notes: CMIN, X2 or Chi-square; DF, degrees of freedom; GFI, goodness-of-fit index; RMSEA, root mean square error of approximation; CFI, comparative fit index.

The final structural model, which shows coefficients in unstandardized form, had three significant regression paths among the latent variables. The dotted lines represent the eliminated paths (see Figure 5-8). Table 5-6 exhibits standardized regression weights including direct effects and indirect effects. Among the direct effects, risk perception → AEITS and travel motivation → AEITS were negative. The correlation between risk perception and travel motivation was -0.140 at the 1% significance level.

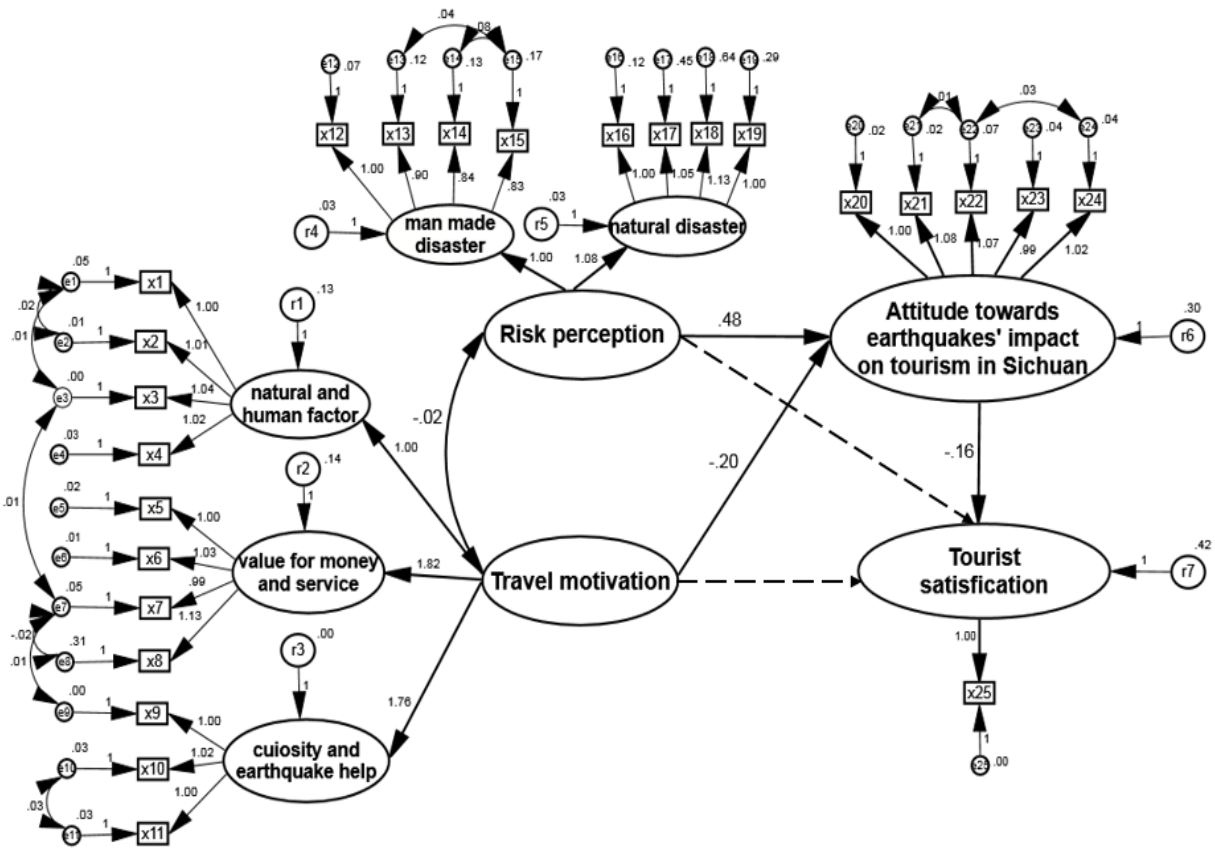

Fig. 5-9 Modified model 2.

Note: Coefficients estimated are all unstandardized. Dotted lines represent non-significant paths.

Table 5-6 Standardized regression weights

Hypothesized causal paths	Direct effects	Indirect effects	Total effects
H2 (Risk perception → AEITS)	0.413***	-	0.413
H3 (Risk perception → Tourist satisfaction)	NS	-0.368	-0.368
H4 (Travel motivation → AEITS)	-0.108**	-	-0.108
H5 (Travel motivation → Tourist satisfaction)	NS	0.097	0.097
H6 (AEITS → Tourist satisfaction)	-0.892 **	-	-0.892

Notes: * represents at 10% significance level; **, 5% significance level; ***, 1% significance level; NS means non-significant (the paths were deleted).

5.5 Conclusion and discussion

5.5.1 Conclusion

The objective of this survey is to explore tourist's risk perception and model tourists'

risk perception, travel motivation, AEITS and satisfaction. A conceptual model with six paths was proposed on the basis of literature review. The hypothesized model was tested by applying the SEM approach using data obtained from a questionnaire survey in Sichuan. After the conceptual model was estimated, its fit was investigated. Analysis of the AMOS 22.0 output suggested that the modified model 2 was better than the original hypothesized model and the revised model 1. Therefore, the conceptual model and the revised model 1 were rejected, and the modified model 2 was accepted as the final model.

The hypotheses proposed for the structural model were partially supported by the data. The findings of the study confirmed that the perception of risk was positively associated with AEITS, whereas travel motivation negatively impacted AEITS in a regional southwest China context. The perception of risk was negatively correlated with travel motivation. The perceived impact of earthquakes on tourism in Sichuan likely decreases the level of tourist satisfaction. In addition, the perception of risk is indirectly and negatively associated with tourist satisfaction, and tourist satisfaction is indirectly and positively impacted by travel motivation. The nonsignificant paths of risk perception → tourist satisfaction and travel motivation → tourist satisfaction were deleted.

As Figure 5-8 indicates that the coefficient between risk perception and travel motivation is negative, and the negative coefficient of 0.02 shows that a negative relationship exists between risk perception and travel motivation (H1). Therefore, when tourist wants to travel, safety and security factors are somewhat interactive. A stronger motivation to travel is associated with lower risk at the tourist destination. H2 which suggests that risk perception is positively related to the perceived earthquakes' impact on tourism in Sichuan is supported, as the standardized coefficient from risk perception to AEITS is 0.48 and direct effect of regression weight is 0.413. The proposed path from risk perception to tourist satisfaction is not supported by the data, because the path that was not statically significant was deleted in the final model, even though the results exhibited an indirect and negative effect of risk perception on tourist satisfaction (H3). H4 which states that that stronger motivation to travel in Sichuan is associated with lower perceived damage caused by earthquakes is supported. The results are consistent with the findings by Law (2006) and Roehl and Fesenmaier (1992) that generally tourists believe that the destinations they select are with low risk. The findings did not support H5, which suggests that travel motivation is positively related to tourist satisfaction. The results imply that the perception of risk does not directly affect tourist satisfaction, although the standardized regression weight as indicated by the indirect effect coefficient of 0.08 in Table 5. A negative significant relationship was found between AEITS and tourist satisfaction (H6). The significant path as indicated by a negative 0.16 reveals that the perceived damage caused lower satisfaction with travel.

Our findings that the attitude toward the impact of earthquakes, which is directly affected by the perception of risk and travel motivation, is an antecedent of tourist satisfaction makes the observed variables of AEITS (primarily referring to the safety factor) in the model important. Therefore, safety should be emphasized by official agencies and operating sectors. We suggest that local agencies provide support policies for disaster preparedness, such as building code and tourism recovery that includes infrastructure and facility recovery, and implement strict safety regulations. As the demographic profiles (see Table 5-1) shows that the vast majority of the respondents were from southwest China (86.4%) and 68% of the respondents claimed that they received their tourism information primarily from their relatives, friends or colleagues, these mean that word of mouth plays an important role in tourism development in Sichuan. Therefore, the need exists for cooperation among numerous stakeholders in a destination to improve tourist' experiences such that the destination's image is improved. Marketing techniques, including advertising, public relations and tourist information organizations that provide accurate information to tourists and potential tourists to avoid reputational rumors and to correct misinformation and perceptions that customers hold about a travel destination (Ritchie, 2004), are helpful for post-disaster tourism destination recovery from the perspective of tourism demand. This chapter also recommends developing new tourism projects related to earthquakes for post-disaster tourism destinations (Pottorff and Neal, 1994) because the results reveal that the factor loading from curiosity and the earthquake help factor to travel motivation is significant, with a value higher than 1.

This chapter applied SEM approach to explore the inter-relationship among risk perception, travel motivation, AEITS, and tourist satisfaction using observed variables. It is suggested that the approach is available and is recommended destination policy makers can use this method to analyze tourists' attributes to support references for them during decision making.

The findings of this chapter indicate that the developed model that supports the model's fit was acceptable. However, as only four factors in the model were considered during the analysis of Sichuan, therefore, identifying and investigating other factors that may influence tourist satisfaction and loyalty, such as a rumor factor, is necessary. In addition, it is vital to test the model more strictly with different examples.

5.5.2 Discussion

The findings show that word of mouth plays a critical role for tourists in tourists making tourism decision, because the main information about the destination from their family members, relatives or colleagues. It is in accord with another characteristics for tourism that is tourism products (mainly tourism experience) are almost produced and

consumed simultaneously and at the same place and time. The product cannot be on trial in advance. So, not only potential tourists, current tourists in recovery period are also of great concern.

Tourist satisfaction is an important point. Another issue is suggested to take how to help tourists in travel especially the inconvenient caused by damage in effect or recovery durations into consideration, as their positive propaganda is much better than advertisements. After huge earthquakes public relationship should be included in crisis management. When it comes to communication strategies, interpersonal communication plays an important role in risk communication.

The results also propose some measures in reducing risk perception and increasing motivations for the case of Sichuan.

5.5.3 Limitations

The current study has several limitations. First, the developed model in this chapter relied on data collected from tourists limited to Chengdu, Sichuan Province and the very tourists traveling in the study sites, not including potential tourists. Future study is necessary required to apply this approach to other destinations and to take appropriate method to catch the perception of potential tourists. Second, although visitors were randomly invited to fill in the questionnaire, this survey was conducted in August, which corresponds to summer vacation for students in China. Therefore, college age and adult groups accounted for a significant proportion of the sample, which may result in a large number of well-educated respondents with low income. Such a sample may introduce bias in the results and affect the perception of risk that the destination may be low risk, thereby possibly affecting the results of the structure model. Conduct surveys in different seasons is suggested to reduce bias of sample. Finally, given that 86.4% respondents were from southwest China, the sample seems biased toward the visitors from areas near the destination. However, statistical data on visitor residence are unavailable from the official website of Sichuan, except for from 2003 to 2005. The statistical results show that more than 76% of the visitors came from southwest China during the period (Sichuan Tour Agency, 2006).

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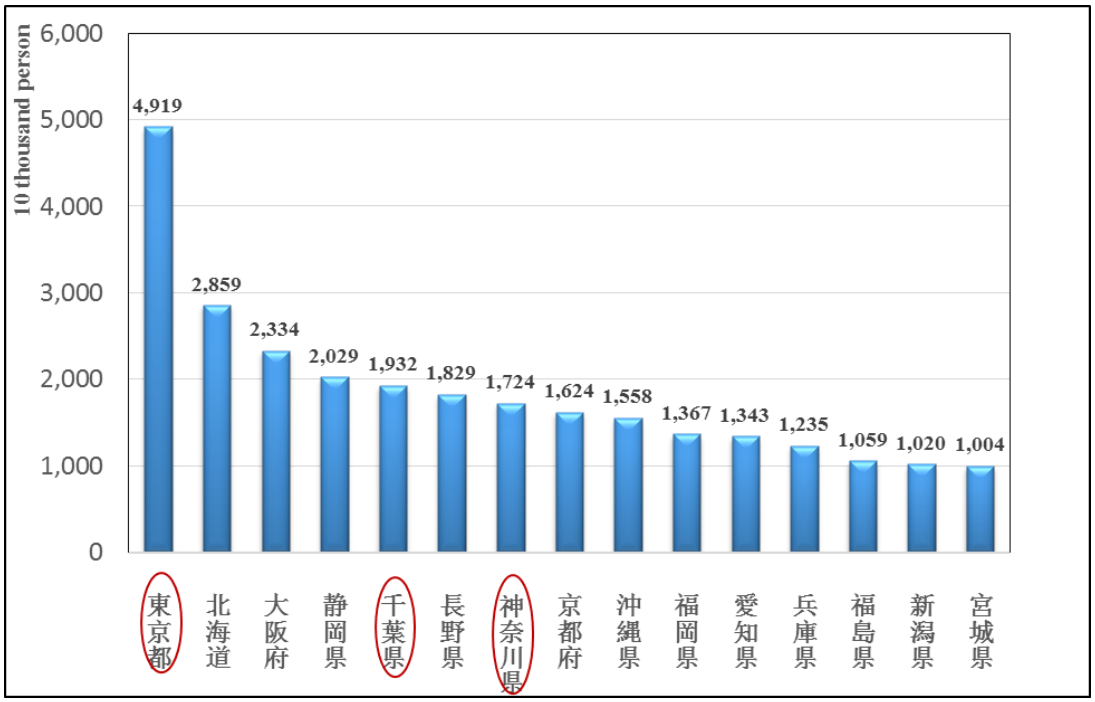
Chapter 6 Tourism sector preparedness in zones with a high seismic risk: Case study on the National Capital Region of Japan

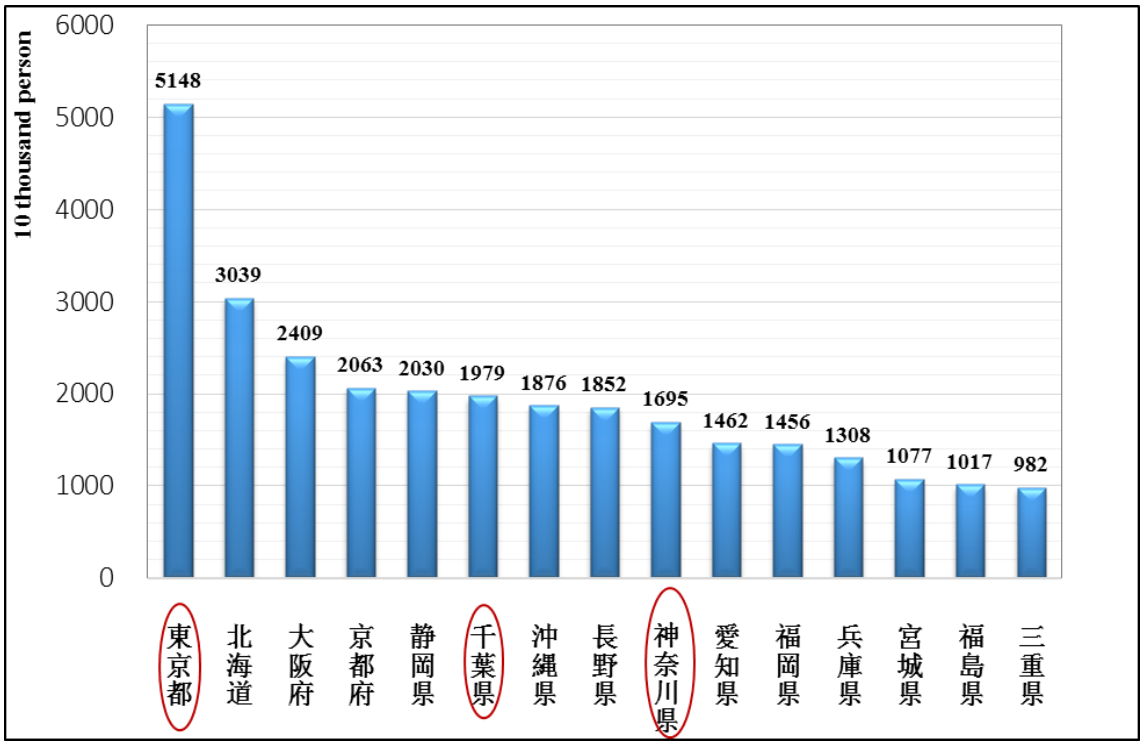
6.1 Objectives

Tokyo is Japan's capital and also a famous tourist 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). As a large earthquake is predicted to strike the capital area in the near future, it is extremely necessary to investigate how the tourism industry in Tokyo is prepared for the disaster and whether it has a crisis management plan. Tourism sectors play a leading role in tourism development. As such, this work will conduct surveys, including field and postal questionnaire surveys, among stakeholders in the tourism industry and related organizations.

This chapter has two objectives. First, it intends to examine the perception, preparedness, and resilience of hospitality or restaurant managers toward the forecasted earthquake in the capital area of Japan, thereby illuminating the current levels of earthquake preparedness. Second, it will explore the main factors related to disaster preparedness to shed light on policies in promoting tourism earthquake preparedness. As the perception of natural disasters held by tourism managers may influence the adoption of appropriate mitigation and preparedness measures, and thus, decrease vulnerability and increase sustainability (Meheux and Parker, 2006), this chapter will also investigate the interrelationships among managers' risk perception, business preparedness, and resilience. These findings are expected to provide references for policymakers in promoting crisis planning in the tourism industry.



a. 2012



b. 2013

Fig. 6-1 Total number of accommodation guests in individual prefectures (Top 15).
(Data source: Japan Tourism Agency)

6.2 Tokyo inland earthquake disaster

Experts estimate that a large earthquake will strike the capital area in the near future. Previous studies have indicated that disasters, especially huge earthquakes such as the Great East Japan Earthquake, impact tourism demand significantly. Therefore, the preparations undertaken by hospitality enterprises and restaurants in Tokyo for the expected disaster need to be investigated, including the fact of whether they have a crisis management plan. Based on this background, the current study conducted surveys. The following Figure 6-2 shows the predicted earthquakes, including Tokyo Inland earthquake. Figure 6-3 indicated the estimated the damage if Mw 7.3 earthquake would occur in south capital center (the Cabinet Office, 2013) and north of Tokyo Bay area (Suzuki and Hayashi, 2008) respectively.

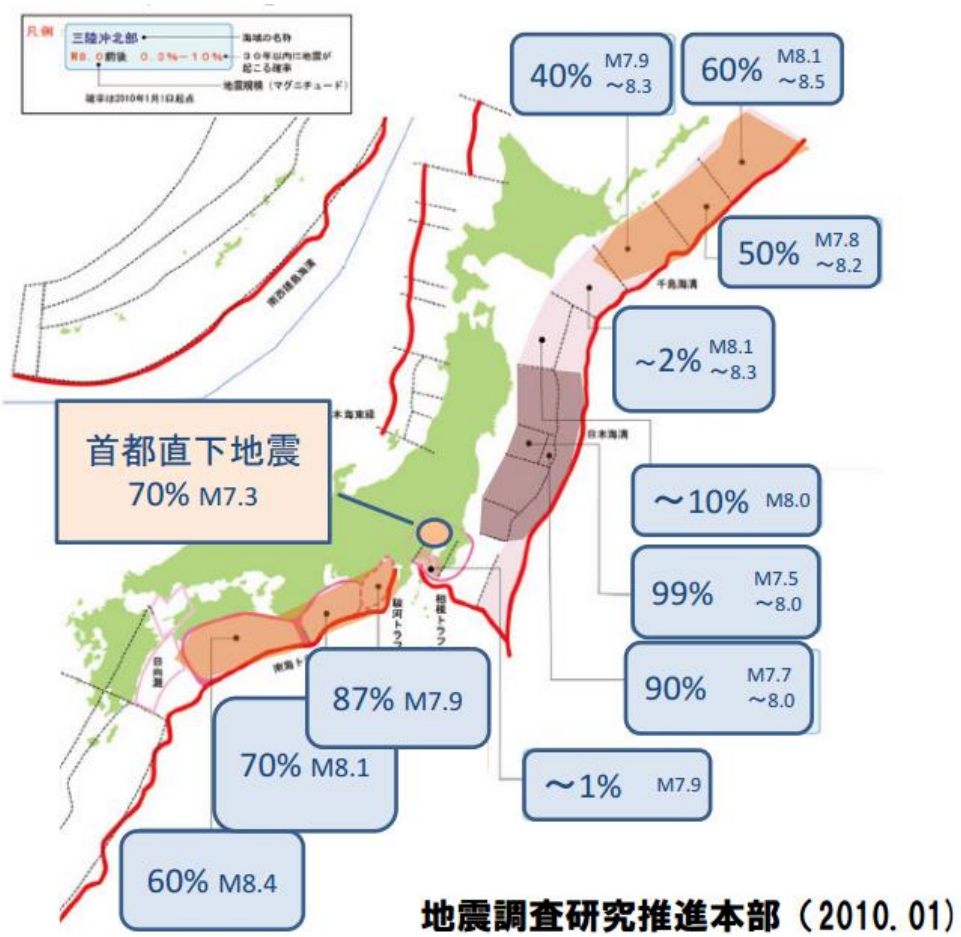
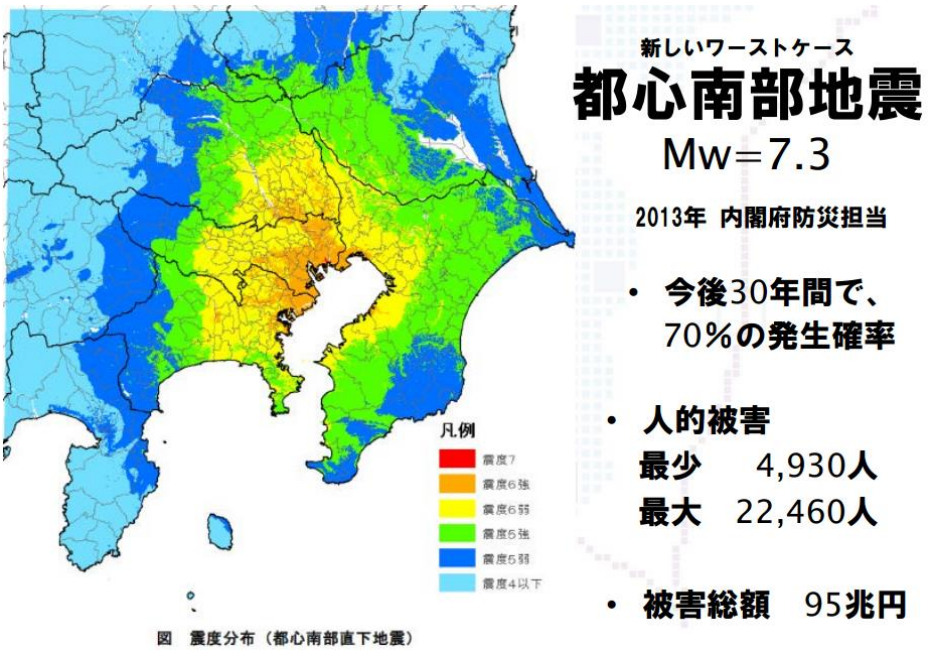
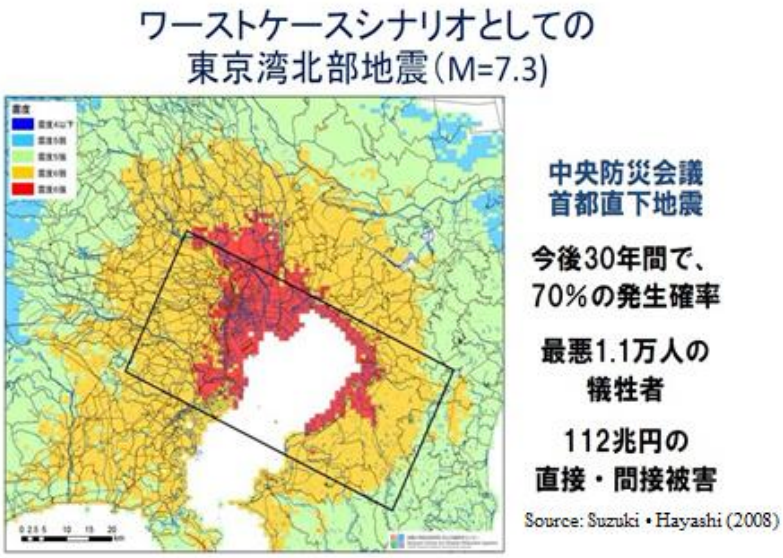


Fig. 6-2 Long-term evaluation of subduction earthquake and earthquake in Tokyo Metropolitan Area.



a. Epicenter in south capital center.
Source: https://resiliencej.files.wordpress.com/2014/08/140204_kaicho.pdf



b. Epicenter in the north of Tokyo Bay area.

Fig. 6-3 Estimated damage due to earthquakes in Tokyo Metropolitan Area.

6.3 Methods

6.3.1 Interviews with tourism organizations

Semi-structured interviews with officers in charge were conducted in the earthquake-damaged areas of Kobe, Awaji, and Tohoku, as well as Tokyo, which has a high risk of

experiencing earthquake disasters, in January and February 2013. The study found that none of the respondents had a tourism disaster plan or business continuity management plan. As for disaster prevention for tourists, they mentioned disaster maps in several languages for tourists. After the Great East Japan Earthquake, rumors were severe. As such, recovery measures were taken, such as "Visit Japan-Tohoku," a tourism campaign.

Apart from the absence of a tourism disaster or business continuity management plan, a plan especially for earthquake disasters was alarmingly non-existent. In Tokyo, a number of respondents suggested that accommodations may offer such measures as allowing visitors to stay longer.

6.3.2 Pilot and postal surveys

The field survey was conducted from March 2 to 9, 2014. The objective was to check the validity of the designed questionnaire, and then implement modification as needed. In this program, the main interviewees were staff members working in restaurants and hotels near Ueno, Shibuya, Shinagawa, Asakusa Kita Senju, and Tokyo Stations. First, the interviewer introduced his/her background and then explained the purpose of the survey in Tokyo. Then, they were asked several questions, such as "do you know whether there is a disaster prevention plan in the restaurants (hotel) you work for?", "what do you think of the predicted Tokyo Inland Earthquake?", "have you attended disaster prevention drills?"

The postal survey mainly focused on the capital area (Tokyo City and Chiba, Kanagawa, and Saitama Prefectures) within the period from February to March 2014. The questionnaire respondents were managers of accommodation facilities and restaurants in the Tokyo bay area. The main variable indicators set in the postal survey are as follows: risk perception (Finnis, 2005; Meheux and Parker, 2006, Orchiston, 2010), threat knowledge (Finnis, 2005; Hystad et al., 2008; Orchiston, 2010), disaster preparedness (Finnis, 2005; Hystad et al., 2008, Orchiston, 2010), earthquake preparedness (Orchiston, 2010), perceived resilience (Orchiston, 2010), and risk communication (Meheux and Parker, 2006; Orchiston, 2010) have been considered.

Fig. 6-4 Preparation for postal survey.

6.3.3 Sample

A total of 2,000 postal questionnaires were sent to hotels (1,652, distributed to hotels in Saitama Prefecture [124], Kanagawa Prefecture [412], Chiba Prefecture [330], and Tokyo [786]) in the National Capital Region of Japan and restaurants near Tokyo bay (348) from March 15 to 31, 2014. The mailing lists were derived from hotel (Yahoo Japan, booking.com) and restaurant booking websites (ぐるなび). A total of 333 questionnaires were returned, accounting for a response rate of 16.7%.

Table 6-1 shows the demographic profile variables of the respondents, including age, length of service, and educational level. A majority of the respondents reported being over 46 years old and having served 11 years or longer. More than half (55.4%) of the 175 respondents received graduate school education or higher. The demographic profile is accord with the manager position profile, which requires a certain level of experience

and knowledge.

Table 6-1 Demographic profile

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
Techinical/Vocational colleg	60	19.0
Graduate school or above	175	55.4

The survey sites cover the prefectures of Saitama, Kanagawa, Chiba, and Tokyo City. Among the response questionnaires, those from Tokyo accounted for 44.2%. Almost 60% of the respondents employed less than 10 full-time employees; however, tourism sectors belong to a labor-intensive industry. From this point, most of them are small- and medium-sized businesses, and part-time staff positions in these tourism businesses are popular. Almost all of the respondent businesses (94.2%) are hotels (see table 6-2).

Table 6-2 Business profile

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

6.3.4 SEM

To explore the inter-relationships among the factors, SEM was employed.

6.4. Results

6.4.1 Respondents: Businesses and individuals

Figure 6-5 shows the capacity of the accommodations whose managers responded to the survey. The indicator to distinguish small- and medium-sized hotels (SMH) from large-scale hotels was “250 rooms” (Chan, 2011). More than 90% of the responding businesses were SMH. This finding might indicate that they are less prepared for disasters; compared with large enterprises, small- and medium-sized businesses are more vulnerable to natural disasters owing to resource, knowledge, planning, and experience gaps (APEC, 2014).

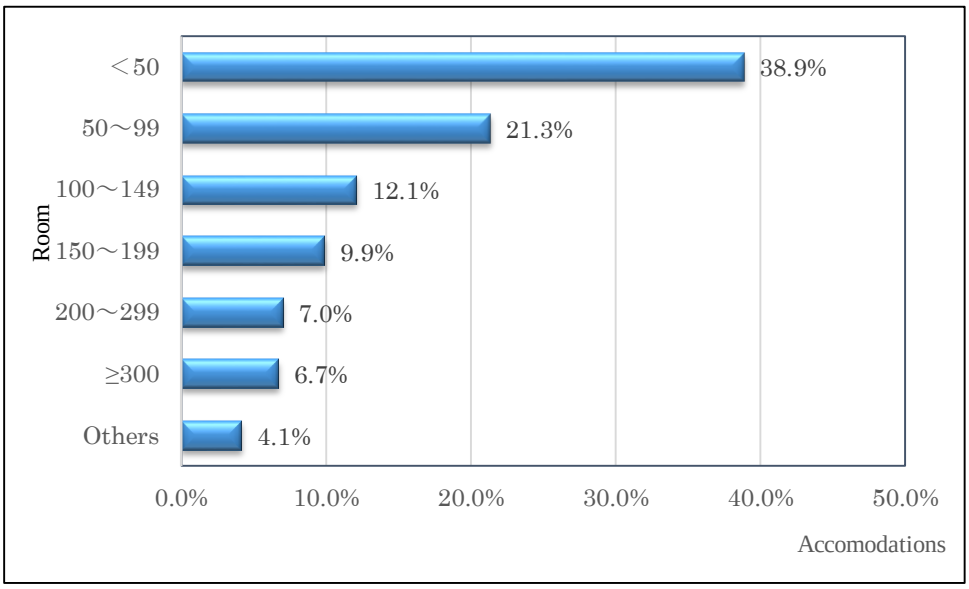


Fig. 6-5 The size of accommodation responses. (n=314)

6.4.2 Risk perception

Figure 6-6 presents the responses to risk perception issues. For the question "what do you think of the probability of disasters (volcano eruption, tsunami, earthquake, tornado, storm, drought, and flooding) impacting your locality?", the results showed that "likely" and "very likely" were chosen by more than 50% of the respondents for tsunami, earthquake, and storm. Particularly, 58.4% of the responders believed that an earthquake disaster would likely impact their locality. Volcano eruption (62.8%), flooding (43.9%), and drought (62.2%) were considered very unlikely or unlikely to affect the local community.

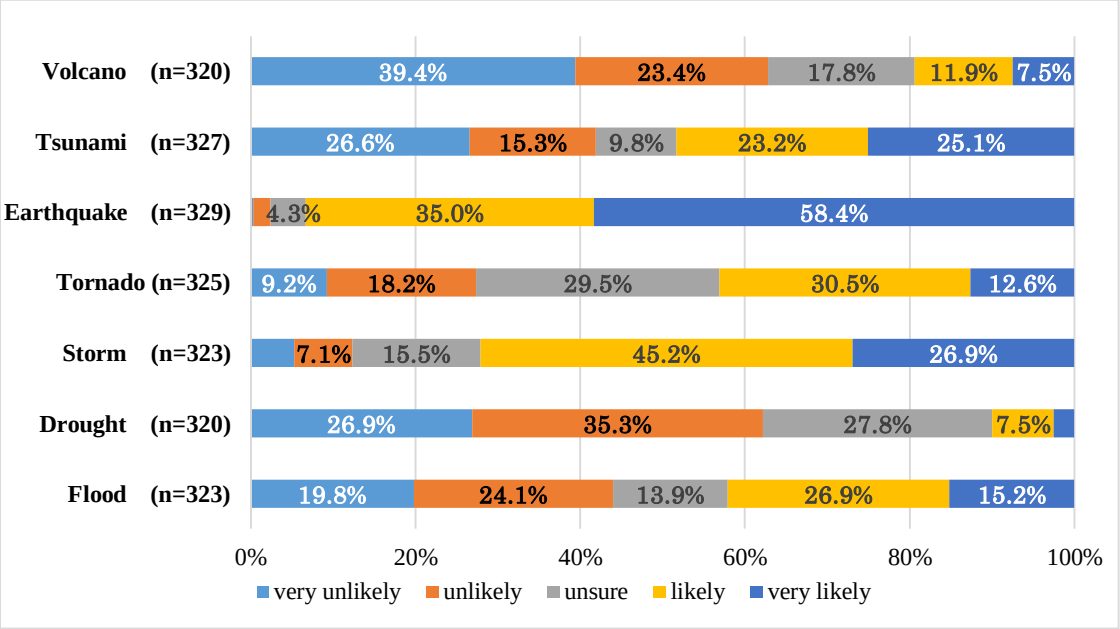


Fig. 6-6 Perception of the risks' impact on the locality.

Figure 6-7 illustrates the responses to the question "what do you think of the probability time for the predicted Tokyo Inland Earthquake (ETIE)?", with six available options. Exactly 35.8% of the respondents thought that the ETIE will occur within 10 years, whereas 30% of them chose "within 30 years." The option "I do not know" accounted for 26% of the responses. Based on these results, more than 75% of the sample thought the ETIE would happen in the near future. Therefore, combined with the results that earthquakes would likely or very likely affect the locality, preparing for the ETIE is imperative.

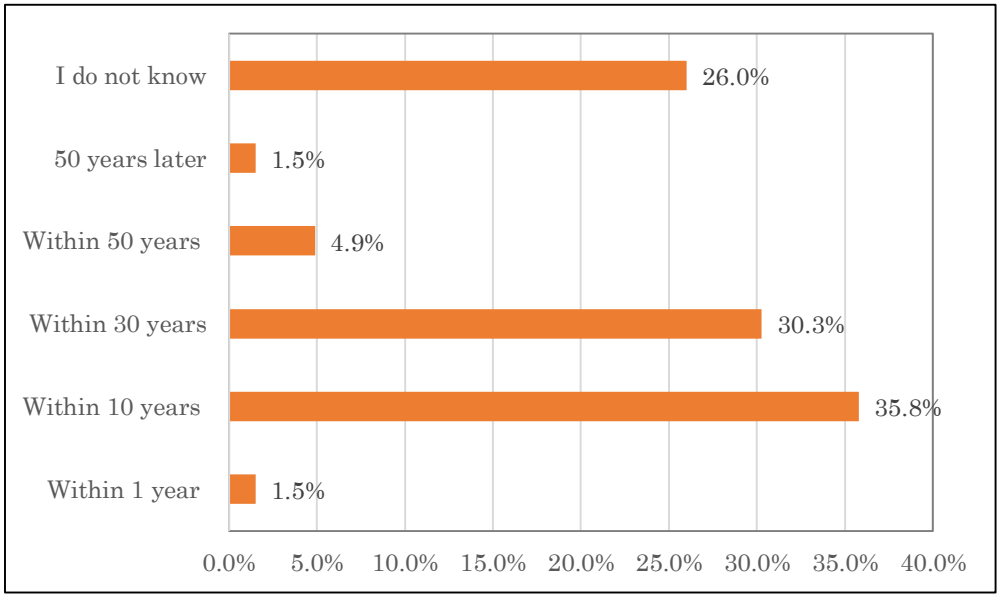


Fig. 6-7. Probable occurrence time of the predicted Tokyo Inland Earthquake. (n＝327)

Responders were asked “to what extent do you think the predicted Tokyo Inland Earthquake will threaten the following items from ‘not at all’ to ‘greatly’?” More than 80% of the respondents indicated that the ETIE would probably or greatly impact places of residence, businesses, and their family members. More than 70% thought that the earthquake would probably or greatly affect their property and their own safety. These responses indicate the perceived threat that will be caused by ETIE. (Figure 6-8)

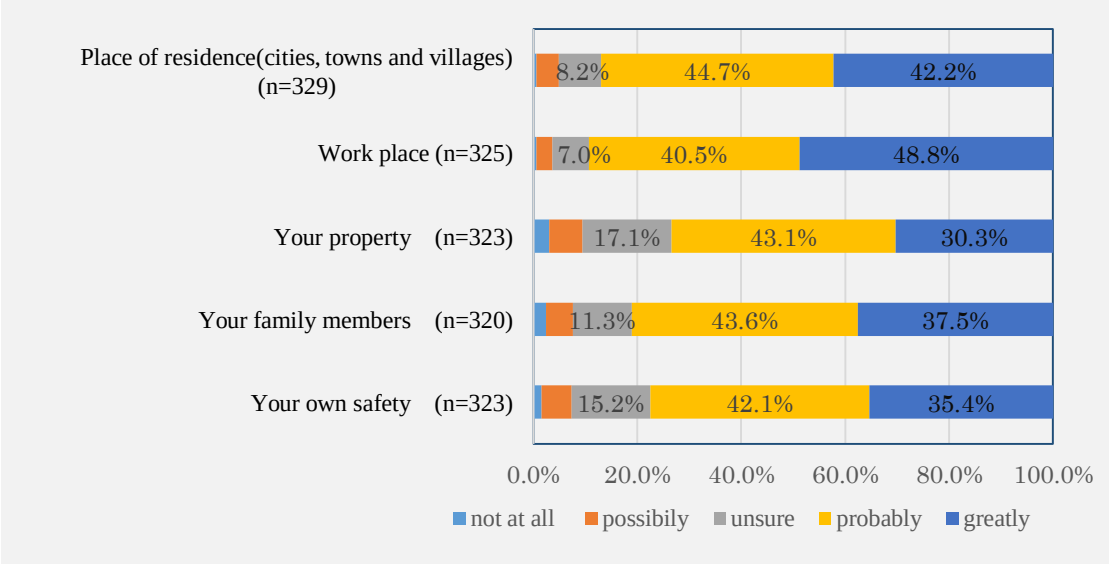


Fig. 6-8 Perception of threat caused by the predicted earthquake.

Figure 6-9 shows the results of the survey question referring to the perception of preparedness for the ETIE. More than half of the respondents (n=320) believed that preparing for an earthquake would help businesses recover from the disaster, although 30% were unsure about whether preparing would contribute to business recovery. Almost three-fourths of the respondents agreed or strongly agreed that preparing for the ETIE would significantly reduce the possible damage to their enterprise. More than 85% of the respondents strongly disagreed or disagreed that it is unnecessary to prepare for an earthquake because the community, council, and/or emergency service would be responsible for it and would provide assistance to businesses. Further, more than half of the respondents strongly disagreed or disagreed that the ETIE will be too destructive such that preparing sufficiently would be difficult. Nonetheless, 16% of the respondents agreed or strongly agreed with this statement. Overall, most of respondents indicated that the ETIE is not too destructive to prepare for and businesses should prepare for it rather than merely depending on other organizations.

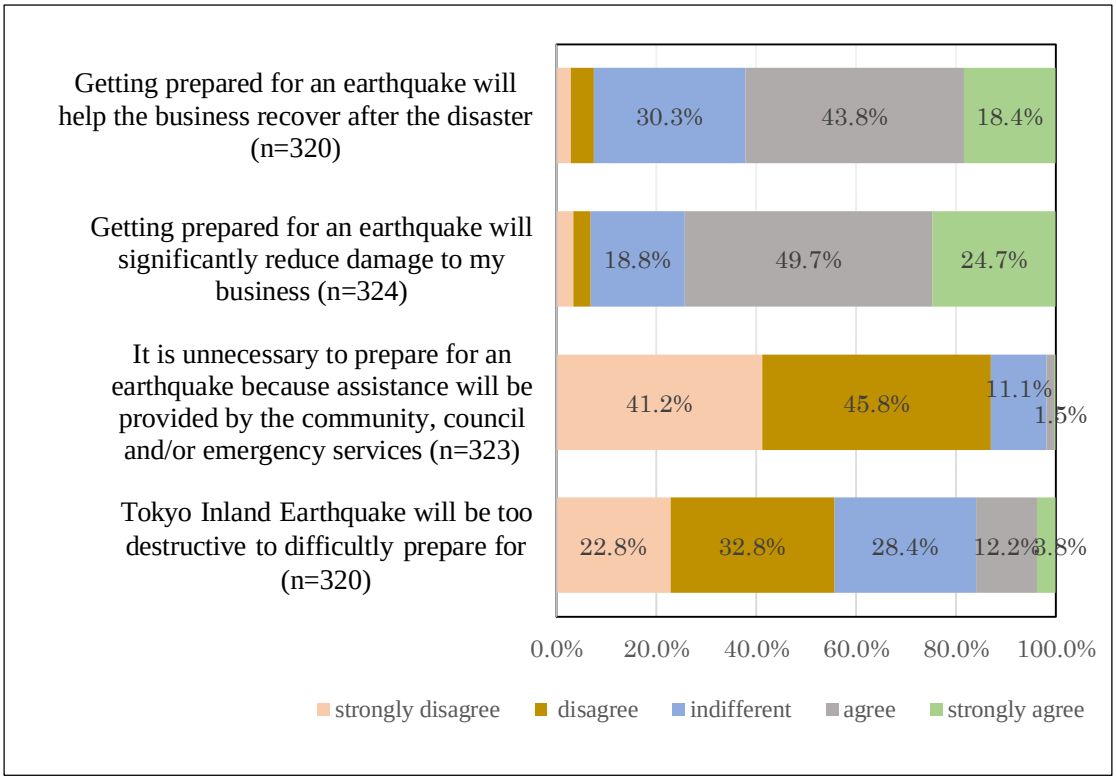


Fig. 6-9 Perception of damage caused by the predicted earthquakes and preparedness.

When asked about their main worries related to the aftermath of the predicted earthquake, among the total sample of 324 respondents, 96.0% (311) selected functional failure of lifelines. The next most common concerns were building damage (selected by 90.1% or 292 of the respondents), transportation cutoff (84.0% or 272), decrease in number of visitors (82.4% or 267), infrastructure damage (75.6% or 245), emergency response (67.3% or 218), secondary damage (64.5% or 209), restoration (61.4 % or 199), and harmful rumors (49.4% or 160). Meanwhile, other main issues were pointed out, such as securing the staff, measures for people who were deprived of a means to return home, compensation, funds, response to foreigners, business continuity, decrease in stock prices, shortage of medical supplies, burial of dead bodies, and injury and death of family members and employees (Figure 6-10). Tourism sectors, similar to other businesses, organizations, and communities, also worry about local infrastructure damage, functional failure of lifelines, and building damage. General disaster preparedness is applicable for these problems. Indeed, existing disaster management frameworks also emphasize these items (Faulkner, 2001; Ritchie, 2004). However, as the tourism industry is unique in that it depends on tourist flows, the respondents were also concerned about the decrease in number of visitors, spread of harmful rumors, safety of staff resources, and responding to foreigners. The industry should take these issues into consideration in preparing a disaster

preparedness plan.

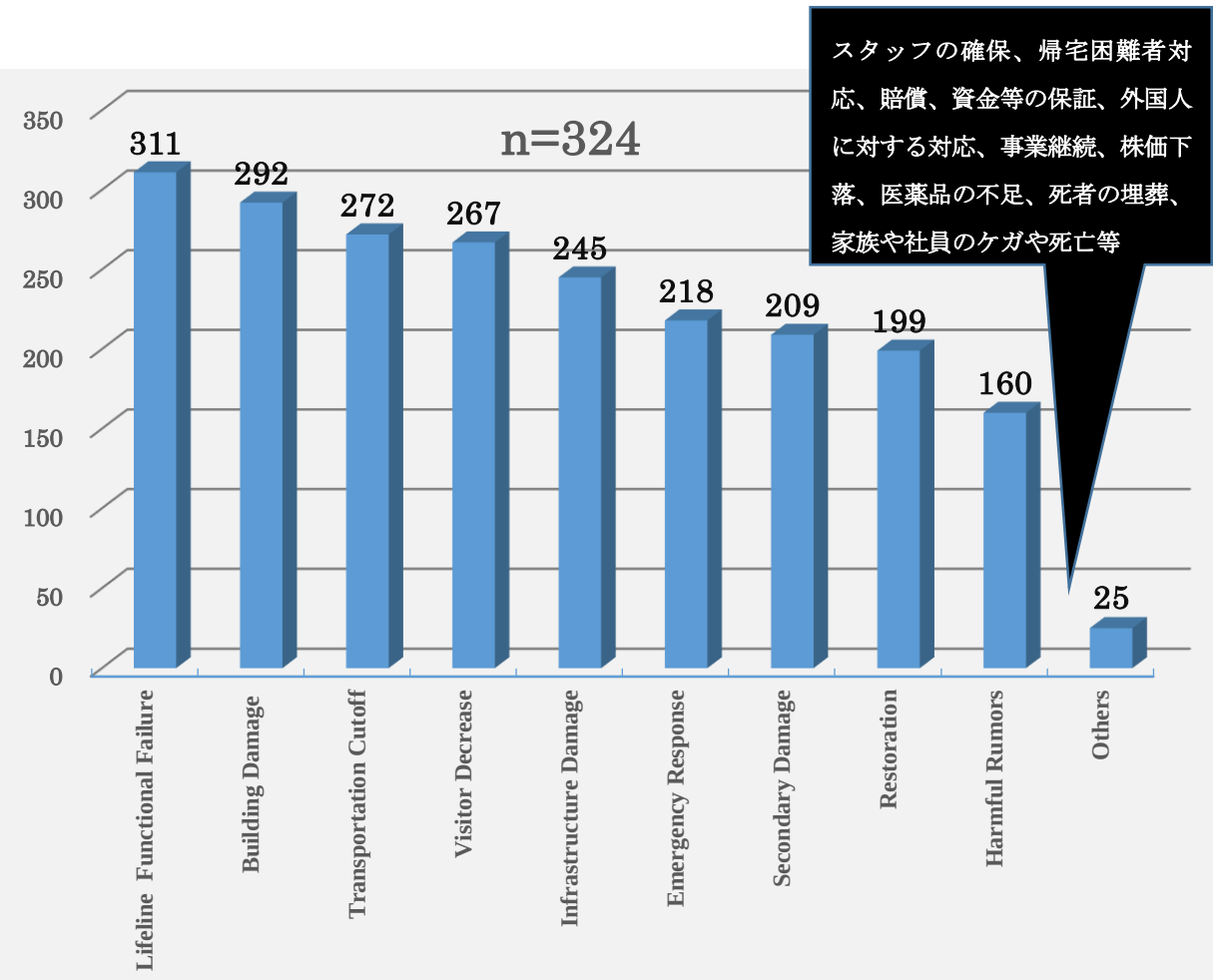


Fig. 6-10 Main possible problems after the predicted earthquake.

6.4.3 Earthquake disaster preparedness

Figure 6-11 presents the survey results for the question “do you often chat with the following persons about earthquake preparedness?” Of the 302 respondents, 72.2% chatted with their family members, and 57.8% of the total 285 sample communicated with their colleagues. The respondents seldom communicated with their neighbors (24.9% of the 273 respondents), other business owners (31.2% of the 276 respondents), and their local council (31.1% of the 283 respondents). The findings coincide with Orchiston’s (2010): managers mostly talked with their family members but rarely communicated with their neighbors, other business owners, and the local council. In Japan’s case, the percentage for communicating with colleagues is higher than that in New Zealand. This finding may mean that disaster preparedness in tourism businesses is at a high level in the capital region of Japan.

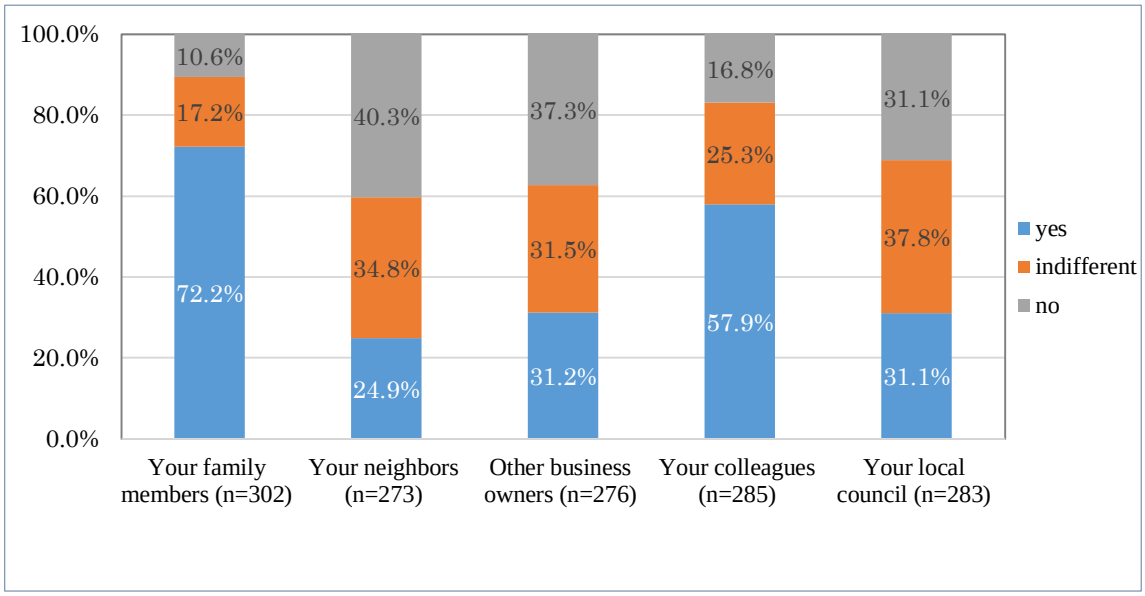


Fig. 6-11 People communicating with about earthquake preparedness.

When asked regarding their participation in emergency drills, 39% of the 324 respondents answered "yes," having participated in a fire drill, disaster drill organized by their local district, disaster drill organized by their local community, and disaster countermeasure training for people deprived of any means to return home. Further, among the respondents who chose "yes," the majority (90%) appreciated the usefulness of the emergency drill. However, the results indicated that 197 (61%) of the 324 respondents had not joined an emergency drill. (Figure 6-12)

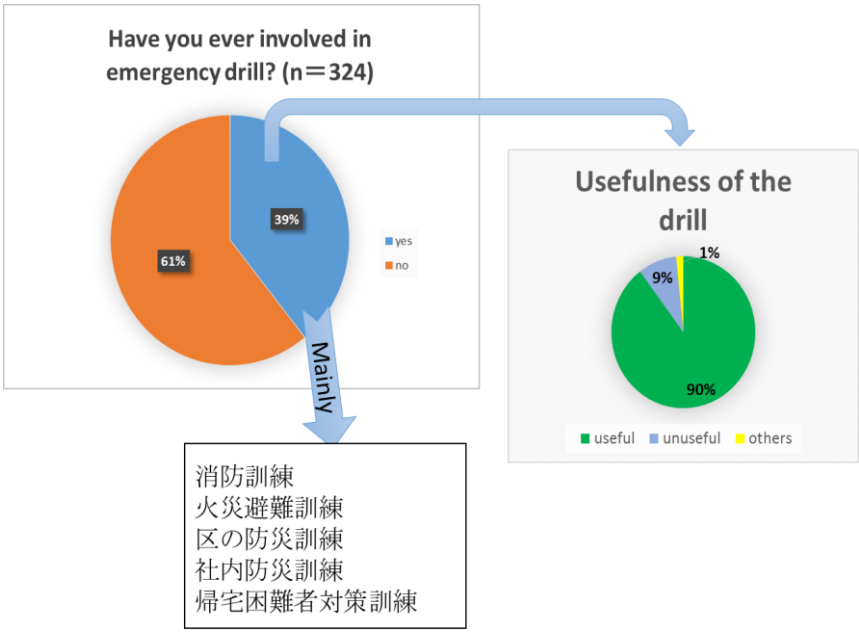


Fig. 6-12 Preparedness of the business and community.

Figure 6-13 illustrates the perceived earthquake preparedness level regarding the following items: the respondent themselves, community, business, local council, central government, and country. Among the 316 respondents in the sample of the "yourself" item, 46.6% reported being completely unprepared or hardly prepared for the ETIE, whereas 29.1% considered themselves to be prepared or completely prepared for it. For the "your business" item, 38.1% of the 315 respondents thought their enterprises completely unprepared or hardly prepared for the ETIE, whereas 33.4% supposed that their enterprises were prepared or completely prepared. The "unsure" option accounted for a large proportion in the items "your community" (61.7%), "your local council" (65.9%), "central government" (74.3%), and "country" (74.6%). The results indicate that respondents seem better aware of the preparedness level of those items closely related to them, such as their businesses and themselves. They appear to lack communication with their community, council, government, and country, and as a result, most of them were unsure of the preparedness level of such institutions.

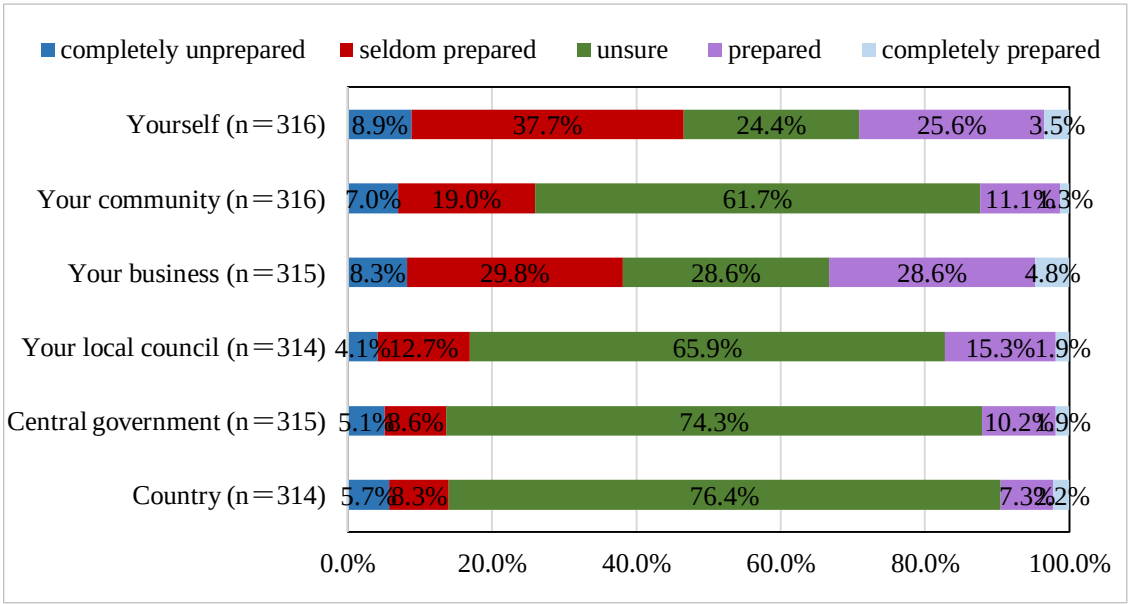


Fig. 6-13 Preparedness level for the predicted earthquake.

In the survey, six questions refer to the disaster preparedness of the respondents' businesses. For the question "does your business have an emergency drill for your staff?" 249 respondents (76.9%) of the total sample of 324 replied "yes." As for organizing disaster drills, almost 85% of the responding businesses reported "yes." Exactly 83.3% of the respondents replied that their businesses had evacuation schemes for visitors, whereas 64.2% (208) of the total 324 respondents stated that they have a written risk reduction plan. However, 77.2% of the businesses had not bought any insurance for disasters, which may be attributed to the small to medium sizes of the responding

businesses. More seriously, almost 60% of the businesses in the capital region of Japan did not have an evacuation scheme for foreign tourists. Assisting foreign visitors is crucial because most of them may have difficulty communicating with locals (Table 6-3).

Table 6-3 Disaster preparedness of business

Disaster preparedness	Yes		No	
	n	%	n	%
Does your business have emergency response drill for staff?(n=324)	249	76.9	75	23.1
Does your business organize disaster drill?(n=327)	276	84.4	51	15.6
Have your business bought insurance for hazards?(n=289)	66	22.8	223	77.2
Does your business have written disaster prevention plan?(n=324)	208	64.2	116	35.8
Does your business have evacuation guidance for visitors?(n=324)	270	83.3	54	16.7
Does your business have evacuation guidance for foreign tourists?(n=322)	129	40.1	193	59.9

6.4.4 Perceived earthquake resilience

Table 6-4 and Figure 6-14 show questions intended to survey the perceived earthquake resilience of the responding businesses. The majority (91.3 %) respondents agreed or strongly agreed that the staff in their businesses would look after one another in the event of the ETIE. When asked about recovery time, about 42% of the respondents thought that their sectors would not recover quickly. Nearly 73% of the 321 respondents reported that they had the responsibility of looking after the staff after the ETIE. The vast majority of the respondents (92%) believed that tourist arrivals would drop and stay low for months after the ETIE. Almost 42% of the respondents were uncertain that their businesses would be sufficiently prepared for the ETIE. When asked whether their businesses would survive the ETIE, 26% of the 326 respondents were unsure; 47% doubted whether their businesses would survive the earthquake. The respondents held a dim view of the impact of the ETIE on their businesses.

Table 6-4 Earthquake resilience of business

Items	Strongly disagree		Disagree		Uncertain		Agree		Strongly agree	
	n	%	n	%	n	%	n	%	n	%
After an earthquake the business staff will look after each other. (324)	2	0.6%	3	0.9%	23	7.1%	153	47.2%	143	44.1%
Things should get back to normal pretty quickly. (325)	37	11.4%	99	30.5%	128	39.4%	48	14.8%	13	4.0%
I have a responsibility to look after the staff after a big earthquake. (321)	2	0.6%	13	4.0%	72	22.4%	160	49.8%	74	23.1%
There will be a drop in visitor numbers for many months after the earthquake. (325)	1	0.3%	4	1.2%	21	6.5%	97	29.8%	202	62.2%
I am confident that our business is prepared for the earthquake. (325)	13	4.0%	93	28.6%	136	41.8%	73	22.5%	10	3.1%
I doubt our business could survive the aftermath of Tokyo Inland Earthquake. (326)	17	5.2%	38	11.7%	85	26.1%	124	38.0%	62	19.0%

When asked about the possible reopening time after the ETIE, nearly 35.4% of the respondents responded “within a month,” 33.2% said their sectors would reopen within one to six months, and 18% thought they would stay closed for at least six months. Nearly 10% of the respondents stated that they might have to close for good.

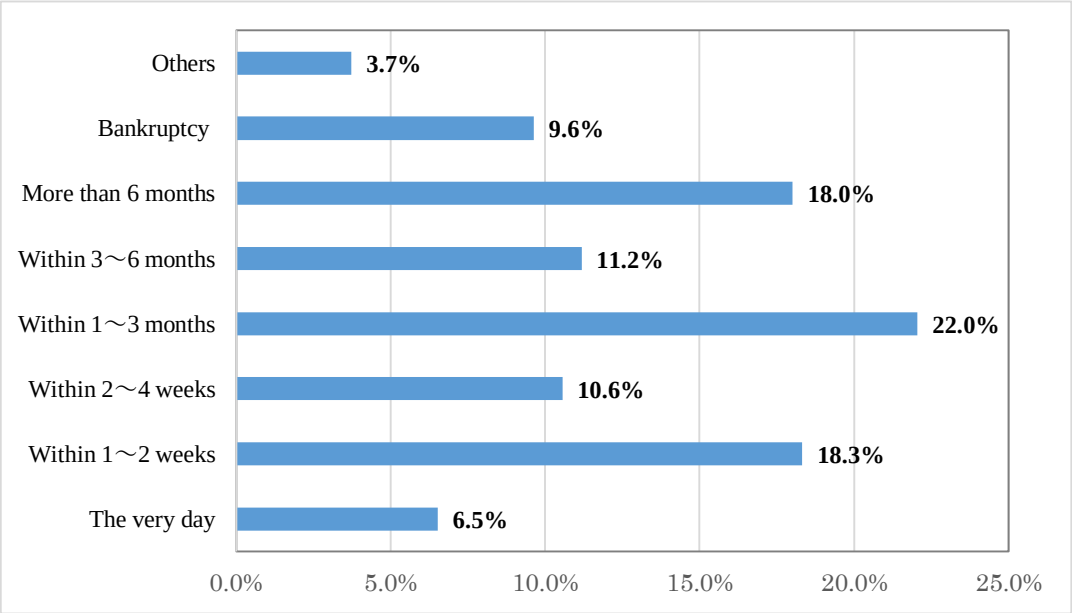


Fig. 6-14 Reopening time of tourism sectors after the predicted earthquake (n＝322).

Although they perceived that the ETIE would largely affect the tourism industry in the capital region, and even threaten the survival of their businesses, the respondents were optimistic that businesses would reopen after the ETIE.

6.5 SEM

6.5.1 Model proposition

Table 6-5 shows the latent constructs and observed variables according to the questionnaire items used to measure latent constructs. SEM analysis was conducted using the software Analysis of Moment Structures software (AMOS) version 22. Before hypothetical model could be proposed, reliability and validity analyses must be conducted to test the measurement model fit. Reliability analysis refers to whether the observed variables, chosen to indicate the construct, actually measure the same (unobserved) concept. Validity analysis focuses on whether one observed variable truly measures the construct intended by the researcher (Valle et al., 2006).

Table 6-5 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), Meheux and Parker (2006), 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), Hystad et al. (2008), 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), Hystad et al. (2008), 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	Orchiston (2010)
Risk communication (5)	Have you discussed earthquake preparedness with your family members? (x25) Have you discussed earthquake preparedness with your neighbors? (x26) Have you discussed earthquake preparedness with other business owners? (x27) Have you discussed earthquake preparedness with your colleague? (x28) Have you discussed earthquake preparedness with local council? (x29)	Adopting the Likert - Scale five - point measure the items	Meheux and Parker (2006), Orchiston (2010)
Perceived resilience (5)	After an earthquake the business staff will look after each other. (x30) Things should get back to normal pretty quickly. (x31) I have a responsibility to look after the staff after a huge earthquake. (x32) I am confident that our business is prepared for the earthquake. (x33) I doubt our business could survive the aftermath of Tokyo Inland Earthquake. (x34)	Adopting the Likert - Scale five - point measure the items	Orchiston (2010)

Number in parentheses means the total of observed variable.

6.5.1.1 Reliability analysis

Nunnally (1967) recommended that the acceptable value of an item's Cronbach's alpha is 0.6 or higher. The index of the Cronbach's alpha for the reliability statistics of all items is 0.737. Table 6-6 shows the results of the measurement model. The measures for risk communication (0.433) and perceived resilience (0.385) did not exceed the recommended level of 0.6. Statistically, the observed variables for risk communication and perceived resilience are not ideal for measuring the constructs. Maruyama (1997) mentioned that low stabilities suggest a rapidly changing variable within the time interval studied. In the present work, respondents toward items of risk communication and perceived resilience varied rapidly. If the measures have low reliability, then the variable can be problematic for any structural modeling (Maruyama, 1997).

Table 6-6 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
Risk communication (5)	0.433
Perceived resilience (5)	0.385

6.5.1.2 Validity analysis

Validity analysis confirms whether an observed variable truly measures the intended construct (Valle et al., 2006). Table 6-7 lists the results of the Kaiser-Meyer-Olkin (KMO) and Bartlett's test. Kaiser (1974) suggested that a KMO value between 0.6 and 0.7 is not ideal but acceptable, that between 0.7 and 0.8 is suitable, and that between 0.8 and 0.9 is very suitable. As all the values are higher than 0.6, the items are valid.

Table 6-7 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

6.5.1.3 Proposed construct model

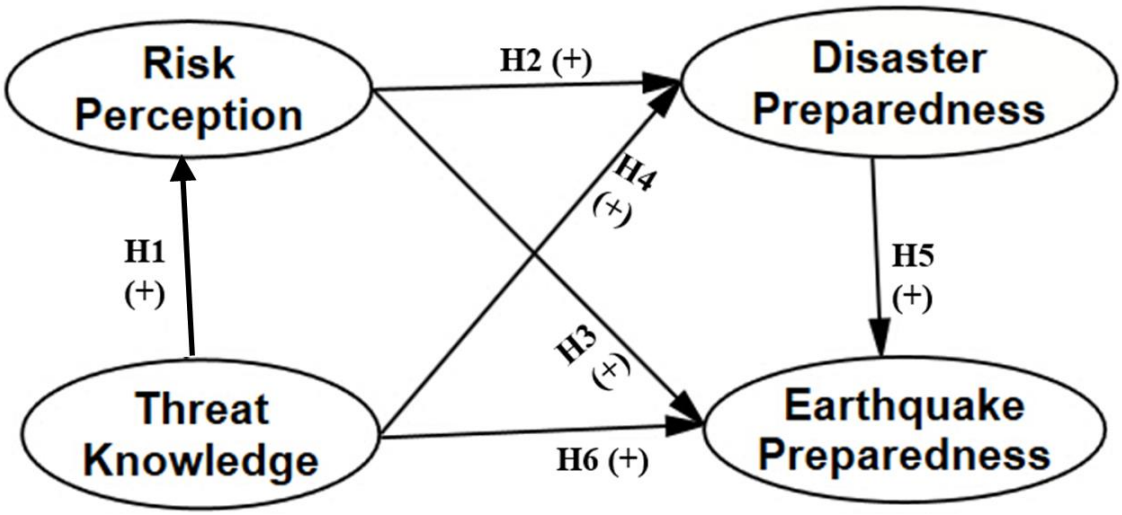


Fig. 6-15 The hypothesized structural model.

The model in Figure 6-15 shows the hypothetical construct model. The constructs of risk perception, threat knowledge, disaster preparedness, and earthquake preparedness are hypothesized to be correlated. Many studies have discussed the connection between perception and preparedness. A number of researchers have stated that risk perception is associated with disaster preparedness (Paton et al., 2000; Sattler et al., 2000; Eisenman et al., 2006; Spittal et al., 2008; Ablah et al., 2009; Cliff and Morlock, 2009). Bourque et al. (2012) suggested that knowledge of a disaster and preparedness affect disaster preparedness. Meanwhile, knowledge has been reported to have an impact on perception (Wallquist et al., 2010; Gregg et al., 2004). Disaster preparedness can be regarded as a general designation, of which earthquake preparedness is a specific aspect. Based on the literature review, the hypotheses are defined as follows:

H_1: The threat knowledge of managers in tourism sectors has a positive and significant impact on risk perception.

H_2: Risk perception positively affects disaster preparedness.

H_3: A higher risk perception helps promote earthquake preparedness.

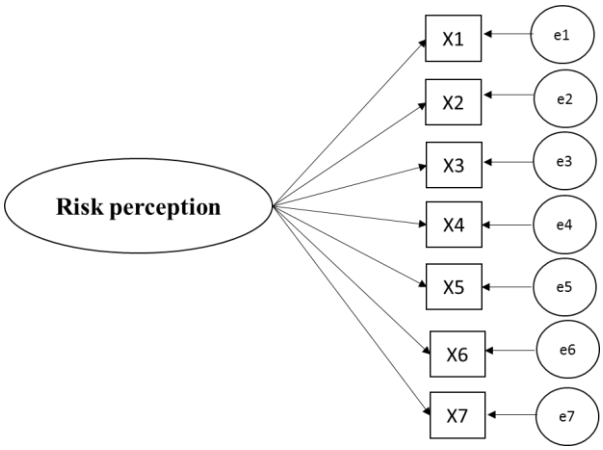
H_4: A higher level of threat knowledge produces better disaster preparedness.

H_5: The level of disaster preparedness positively impacts earthquake preparedness.

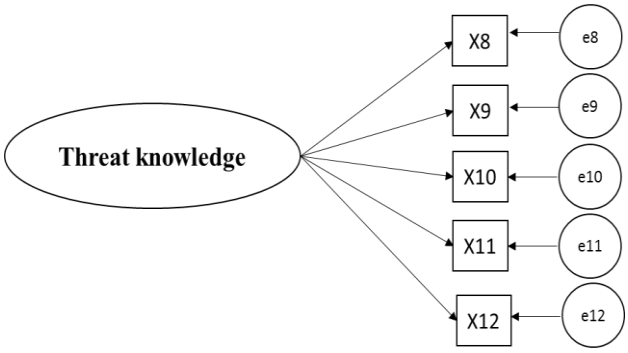
H_6: The level of earthquake preparedness is positively affected by threat knowledge.

6.5.1.4 Measurement model

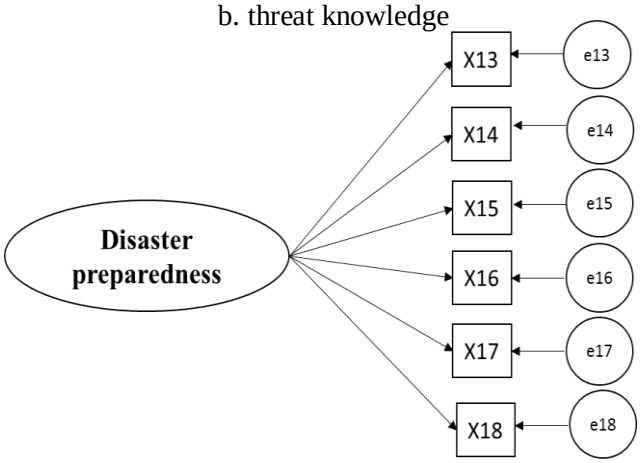
Measurement models specify the relationships between the observed and latent variables. As shown in Figure 6-15 of the construct model, there are four latent variables. The measurement models for these variables are specified in Figure 6-16.



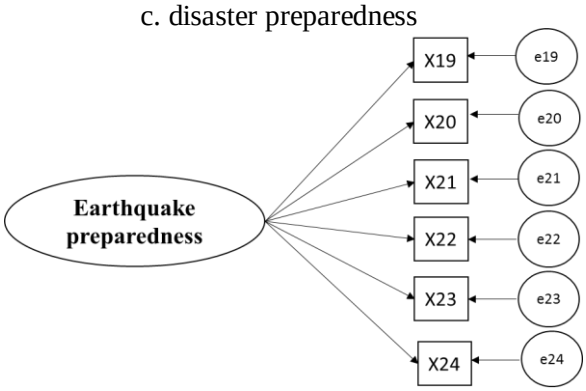
a. risk perception



b. threat knowledge



c. disaster preparedness



d. earthquake preparedness

Fig. 6-16 Measurement model.

6.5.2 Estimation of parameters

Figure 6-17 shows the initial model, in which items e1 through e24 are residual or error variances, and r1 through r3 are errors for latent variables. To identify the scale of the corresponding latent variables, certain path coefficients among the scale of measurements for the latent factors and residuals were set to 1. The model fitting index is shown in Table 6-12.

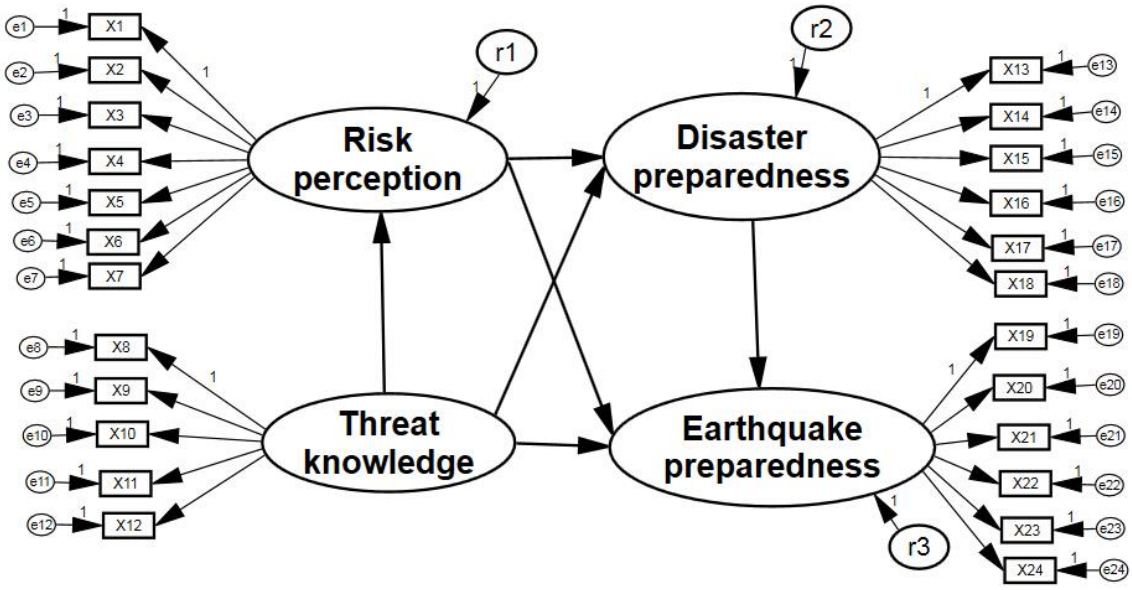


Fig. 6-17 Initial model for estimation.

Regression weights for the initial model (Table 6-8) indicated that several paths (risk perception → disaster preparedness; threat knowledge → earthquake preparedness; risk perception → earthquake preparedness; disaster preparedness → X15) were not significant, especially for the former ones. Thus, the former two insignificant paths were removed, and then the modified model 1 was obtained (Figure 6-18).

Table 6-8 Regression weights for initial model

			Estimate	S.E.	C.R.	P	Label
Risk_perception	<---	Threat_knowledge	.271	.062	4.352	***	
Disaster_preparedness	<---	Risk_perception	-.030	.035	-.878	.380	
Disaster_preparedness	<---	Threat_knowledge	.048	.027	1.818	.069	
Earthquake_preparedness	<---	Disaster_preparedness	.188	.070	2.681	.007	
Earthquake_preparedness	<---	Threat_knowledge	.004	.018	.226	.821	
Earthquake_preparedness	<---	Risk_perception	-.002	.023	-.083	.934	
X1	<---	Risk_perception	1.000				
X2	<---	Risk_perception	.613	.110	5.572	***	
X3	<---	Risk_perception	1.135	.154	7.358	***	
X4	<---	Risk_perception	1.058	.150	7.058	***	
X5	<---	Risk_perception	.419	.077	5.429	***	
X10	<---	Threat_knowledge	.728	.063	11.567	***	
X11	<---	Threat_knowledge	.682	.047	14.480	***	
X19	<---	Earthquake_preparedness	1.000				
X20	<---	Earthquake_preparedness	2.014	.509	3.960	***	
X21	<---	Earthquake_preparedness	1.812	.495	3.664	***	
X22	<---	Earthquake_preparedness	2.699	.658	4.100	***	
X23	<---	Earthquake_preparedness	2.782	.675	4.118	***	
X9	<---	Threat_knowledge	.880	.056	15.745	***	
X8	<---	Threat_knowledge	1.000				
X6	<---	Risk_perception	.994	.174	5.699	***	
X7	<---	Risk_perception	.435	.125	3.478	***	
X13	<---	Disaster_preparedness	1.000				
X15	<---	Disaster_preparedness	.139	.086	1.614	.106	
X16	<---	Disaster_preparedness	.881	.117	7.536	***	
X17	<---	Disaster_preparedness	.434	.085	5.140	***	
X12	<---	Threat_knowledge	.786	.048	16.325	***	
X14	<---	Disaster_preparedness	.858	.102	8.418	***	
X18	<---	Disaster_preparedness	.620	.112	5.551	***	
X24	<---	Earthquake_preparedness	2.468	.603	4.090	***	

6.5.3 Model modification

The modified model 1 (Figure 6-18) shows the paths, and Table 6-9 presents the regression weights for the model. However, the paths (risk perception → earthquake preparedness; disaster preparedness→X15) were found to still be insignificant. Thus, the insignificant paths were again removed. The modified model 2 is achieved, shown in Figure 6-18. Table 6-10 indicates that all paths are significant, at least at 10% significance level.

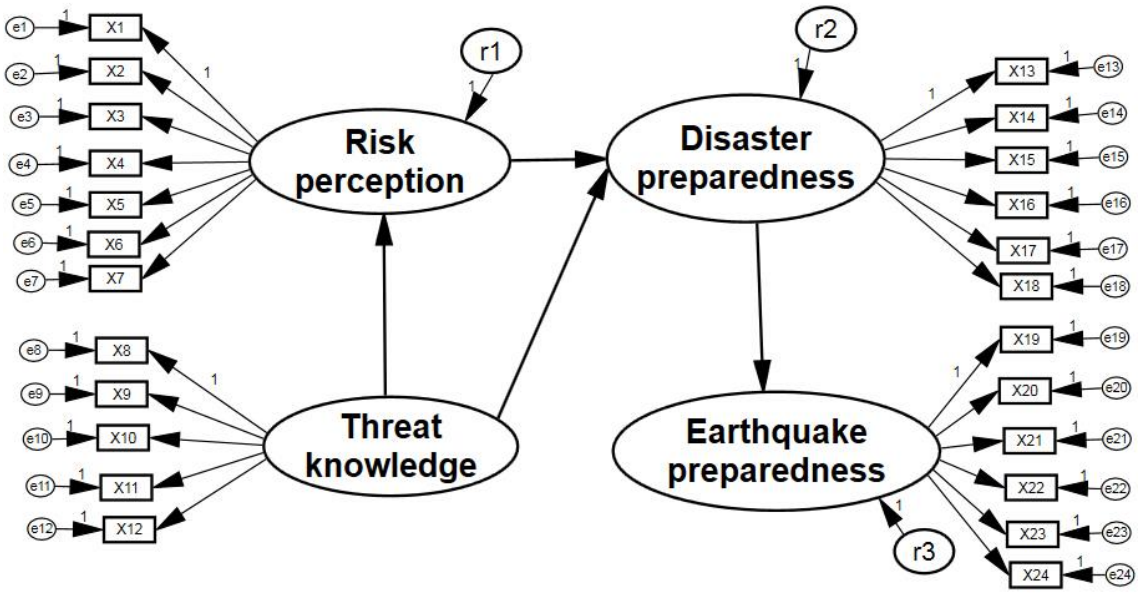


Fig. 6-18 Modified model 1.

Table 6-9 Regression weights for modified model 1

			Estimate	S.E.	C.R.	P	Label
Risk_perception	<---	Threat_knowledge	.271	.062	4.352	***	
Disaster_preparedness	<---	Risk_perception	-.031	.035	-.888	.375	
Disaster_preparedness	<---	Threat_knowledge	.049	.026	1.841	.066	
Earthquake_preparedness	<---	Disaster_preparedness	.190	.070	2.715	.007	
X1	<---	Risk_perception	1.000				
X2	<---	Risk_perception	.613	.110	5.571	***	
X3	<---	Risk_perception	1.135	.154	7.359	***	
X4	<---	Risk_perception	1.058	.150	7.058	***	
X5	<---	Risk_perception	.419	.077	5.429	***	
X10	<---	Threat_knowledge	.728	.063	11.569	***	
X11	<---	Threat_knowledge	.682	.047	14.479	***	
X19	<---	Earthquake_preparedness	1.000				
X20	<---	Earthquake_preparedness	2.014	.509	3.960	***	
X21	<---	Earthquake_preparedness	1.813	.495	3.664	***	
X22	<---	Earthquake_preparedness	2.699	.658	4.100	***	
X23	<---	Earthquake_preparedness	2.782	.675	4.119	***	
X9	<---	Threat_knowledge	.880	.056	15.744	***	
X8	<---	Threat_knowledge	1.000				
X6	<---	Risk_perception	.994	.174	5.700	***	
X7	<---	Risk_perception	.435	.125	3.477	***	
X13	<---	Disaster_preparedness	1.000				
X15	<---	Disaster_preparedness	.139	.086	1.612	.107	
X16	<---	Disaster_preparedness	.881	.117	7.536	***	
X17	<---	Disaster_preparedness	.434	.085	5.140	***	
X12	<---	Threat_knowledge	.786	.048	16.324	***	
X14	<---	Disaster_preparedness	.859	.102	8.421	***	
X18	<---	Disaster_preparedness	.620	.112	5.550	***	
X24	<---	Earthquake_preparedness	2.468	.603	4.090	***	

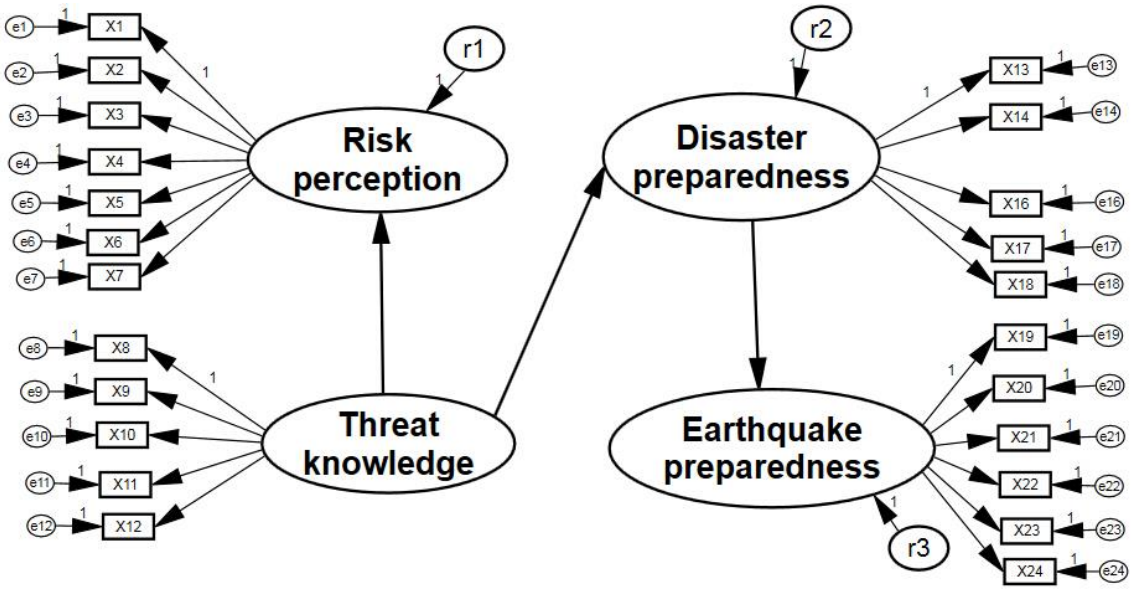


Fig. 6-19 Modified model 2.

Table 6-10 Regression weights for modified model 2

			Estimate	S.E.	C.R.	P	Label
Disaster_preparedness	<---	Threat_knowledge	.041	.024	1.663	.096	
Earthquake_preparedness	<---	Disaster_preparedness	.190	.070	2.721	.007	
Risk_perception	<---	Threat_knowledge	.270	.062	4.344	***	
X1	<---	Risk_perception	1.000				
X2	<---	Risk_perception	.616	.110	5.589	***	
X3	<---	Risk_perception	1.132	.154	7.348	***	
X4	<---	Risk_perception	1.061	.150	7.060	***	
X5	<---	Risk_perception	.420	.077	5.433	***	
X10	<---	Threat_knowledge	.728	.063	11.574	***	
X11	<---	Threat_knowledge	.682	.047	14.474	***	
X19	<---	Earthquake_preparedness	1.000				
X20	<---	Earthquake_preparedness	2.014	.509	3.960	***	
X21	<---	Earthquake_preparedness	1.813	.495	3.664	***	
X22	<---	Earthquake_preparedness	2.699	.658	4.100	***	
X23	<---	Earthquake_preparedness	2.782	.675	4.118	***	
X9	<---	Threat_knowledge	.880	.056	15.750	***	
X8	<---	Threat_knowledge	1.000				
X6	<---	Risk_perception	.988	.174	5.674	***	
X7	<---	Risk_perception	.437	.125	3.487	***	
X13	<---	Disaster_preparedness	1.000				
X16	<---	Disaster_preparedness	.877	.117	7.497	***	
X17	<---	Disaster_preparedness	.435	.085	5.141	***	
X12	<---	Threat_knowledge	.786	.048	16.317	***	
X14	<---	Disaster_preparedness	.858	.102	8.379	***	
X18	<---	Disaster_preparedness	.619	.112	5.538	***	
X24	<---	Earthquake_preparedness	2.468	.603	4.090	***	

David (2011) suggested that a large modification index may be explained by other specification errors. According to ESSE, modification indices indicate how much the chi-square value of a model would drop if a parameter was free instead of constrained. A conclusive test of measurement equivalence can be performed by referring to the modification indices and expected parameter changes for the factor loadings and measurement intercepts. To improve goodness of fit, errors can be related by observing the modification indices and values of parameter change until the largest improvement in fit is achieved (shown in Figure 6-20). Table 6-11 shows the regression weights.

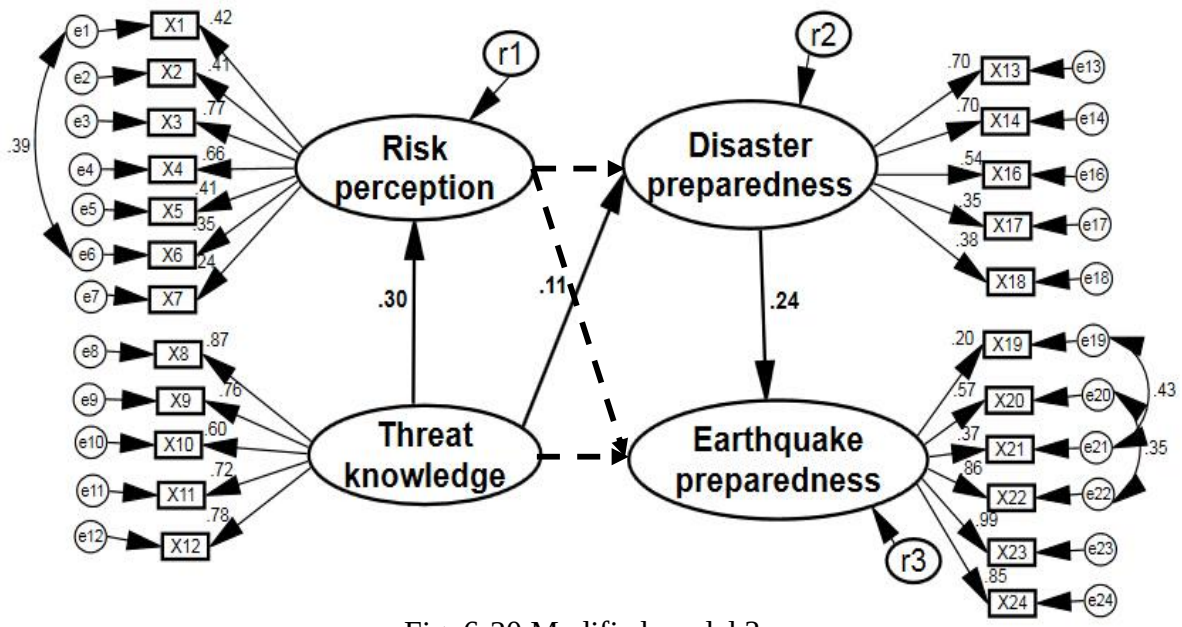


Fig. 6-20 Modified model 3.

6.5.4 Assessment of model and model fit

For a good model fit, the ratio χ^2/degrees of freedom should be as small as possible. The rule of thumb for the goodness-of-fit index (GFI) is that 0.95 is indicative of a good fit relative to the baseline model, whereas values greater than 0.90 are interpreted as acceptable. The rule of thumb for the comparative fit index (CFI) is that values greater than 0.90 are interpreted as acceptable (Hu and Bentler, 1999). The value for the root mean square error of approximation (RMSEA) should be less than 0.05.

Table 6-12 shows the goodness of fit measures. Modified model 3 is the most appropriate one among the models. Thus, it was considered as the final model.

Table 6-11 Regression weights for modified model 3

			Estimate	S.E.	C.R.	P	Label
Disaster_preparedness	<---	Threat_knowledge	.041	.024	1.674	.094	
Earthquake_preparedness	<---	Disaster_preparedness	.162	.064	2.540	.011	
Risk_perception	<---	Threat_knowledge	.208	.054	3.846	***	
X1	<---	Risk_perception	1.000				
X2	<---	Risk_perception	.707	.142	4.992	***	
X3	<---	Risk_perception	1.433	.227	6.311	***	
X4	<---	Risk_perception	1.314	.211	6.211	***	
X5	<---	Risk_perception	.507	.101	5.017	***	
X10	<---	Threat_knowledge	.728	.063	11.567	***	
X11	<---	Threat_knowledge	.682	.047	14.477	***	
X19	<---	Earthquake_preparedness	1.000				
X20	<---	Earthquake_preparedness	2.165	.626	3.456	***	
X21	<---	Earthquake_preparedness	1.916	.484	3.962	***	
X22	<---	Earthquake_preparedness	3.037	.851	3.570	***	
X23	<---	Earthquake_preparedness	3.306	.922	3.586	***	
X9	<---	Threat_knowledge	.880	.056	15.741	***	
X8	<---	Threat_knowledge	1.000				
X6	<---	Risk_perception	.940	.163	5.753	***	
X7	<---	Risk_perception	.532	.155	3.425	***	
X13	<---	Disaster_preparedness	1.000				
X16	<---	Disaster_preparedness	.876	.117	7.492	***	
X17	<---	Disaster_preparedness	.434	.085	5.135	***	
X12	<---	Threat_knowledge	.785	.048	16.312	***	
X14	<---	Disaster_preparedness	.860	.103	8.379	***	
X18	<---	Disaster_preparedness	.619	.112	5.539	***	
X24	<---	Earthquake_preparedness	2.844	.797	3.568	***	

Table 6-12 Goodness-of-fit measures

Model	CMIN	DF	CMIN/DF	GFI	CFI	RMSEA
Initial model (Baseline 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

6.5.5 Results

The hypotheses proposed for the structural model were partially supported by the data. The final structural model, which shows coefficients in standardized form, had three significant regression paths among the latent variables. The dotted lines in Figure 6-19 represent the eliminated paths (risk perception → disaster preparedness [H2], risk perception → earthquake preparedness [H3], and threat knowledge → earthquake preparedness [H6]). The findings match the results by Bourque (2012): risk perception does not have a significant direct effect on preparedness.

The findings of the chapter confirmed that perceived threat knowledge is positively associated with risk perception (H1). Figure 6-19 indicates that the path coefficient of threat knowledge → earthquake preparedness is 0.30 at 1% significance level (Table 6-11). Therefore, the perception of managers impacted their perception of risk.

H4 is also supported: threat knowledge positively impacts disaster preparedness. The path coefficient is 0.11 at 10% significance level.

H5, or the positive association between disaster preparedness and earthquake preparedness, is supported. The standardized path coefficient from disaster preparedness to earthquake preparedness is 0.24 at 5% significance level. Among the observed variables for disaster preparedness, namely, "does your business organize emergency response drills for the staff? (x13)," "does your business organize disaster drills? (x14)," "does your business have a written disaster prevention plan? (x16)," "does your business have an evacuation scheme for visitors? (x17)," and "does your business have an evacuation scheme for foreign tourists? (x18)," the path coefficients of x13 and x14 are higher than that of others. That is, conducting emergency response drills for the staff and organizing disaster drills contribute greatly to earthquake preparedness.

6.6 Conclusion

These surveys intended to investigate the disaster preparedness of tourism destinations, taking the National Capital Region of Japan as a case to achieve the purpose. The SEM approach using data obtained from a questionnaire survey conducted on site was applied to explore the relationship among perceived knowledge, risk perception, disaster preparedness, and earthquake preparedness. After the conceptual model was estimated, its fit was investigated. Analysis of the AMOS 22.0 output suggests that modified model 3 was better than the original hypothesized model and the revised models 1 and 2. Therefore, the previous models were rejected, and modified model 3 was adopted as the final model.

According to the findings, the respondent businesses are well prepared in emergency response planning and drill practice. The majority of them has a risk reduction plan, emergency response plan for the staff, and disaster drill schedule for the staff. However, preparedness in disaster evacuation for foreign visitors was low (40% of the 322 respondent businesses). Few of the businesses (22.8% of the 289 respondent businesses) bought insurance for disasters, which can be attributed to their small to medium sizes. Most respondents were unsure about the earthquake preparedness of their community, council, central government, and country.

This chapter applied SEM to explore the inter-relationship among risk perception, perceived threat knowledge, disaster preparedness, and earthquake preparedness. The findings indicate that the threat knowledge of managers positively impact risk perception and disaster preparedness. Therefore, improving threat knowledge would influence decision making in disaster preparedness. The findings may shed light on the organizations related to risk reduction. However, the findings contradict the results of existing research (Paton et al., 2000; Sattler et al., 2000; Eisenman et al., 2006), which have suggested that risk perception is associated with disaster preparedness. The hypotheses H1, H4, and H5 are supported by the results, which can be helpful to crafting policies and measures in promoting earthquake preparedness.

6.7 Discussion

The tourism industry is a labor-intensive industry that requires substantial human labor to provide service. Many governments encourage tourism development because of its economic effect in the form of employment promotion. However, in the aftermath of large-scale disasters, insufficiency in the number of staff also impacts the recovery of tourism businesses. Moreover, in most of the respondent businesses, part-time employment takes up a large percentage. The survey results showed that respondents worried about the lack of staff resources after predicted earthquakes. This concern is on top of the main issues that general risk reduction planning covers, including damage to buildings, daily lifeline system, and infrastructures. In future tourism disaster management planning, this issue should also be considered.

In the field survey, when asked about disaster management preparedness, the staff and a number of the managers suggested consulting the offices in charge of this aspect. They may have been part-time staff or unaware of the plan or not involved in disaster prevention planning. Workshops, which can make planning more practicable and engage more staff members, are recommended in tourism disaster management planning.

Unlike general disaster management planning, which mainly considers protecting local people from damages, tourism disaster management should pay attention to the customers or visitors who are not familiar with the locality. According to the results, 80.3% of the 324 respondents reported offering evacuation guidance for visitors, but nearly 60% of the 322 respondents stated they did not have evacuation guidance for foreign tourists. A number of those interviewed from tourism organizations mentioned that the language barrier poses difficulties in assisting foreign tourists. Thus, tourism disaster frameworks should emphasize feasible means for assisting them in evacuating and returning home in the event of destructive earthquakes.

The results also indicated that threat knowledge plays an important role as a predictor of disaster preparedness and risk perception. Disaster preparedness was found to be associated with earthquake preparedness. Therefore, policymakers in earthquake-prone tourism destinations may refer to these outcomes to improve earthquake preparedness.

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Chapter 7 Conclusion and discussion

7.1 Conclusion

Using case studies from Japan and China, this study found that huge earthquakes significantly impact tourism demand. Tourist arrival recovery patterns showed periods of a sharp decline, followed by rapid rebound and then wandering. Further, huge earthquakes affect tourism demand, although the impact of disasters on tourism is temporary. Thus, tourism itself has inherent resilience. Nonetheless, the short-term impact on tourism translates to large losses for tourism destinations.

Safety and security are critical factors for tourists. Tourist satisfaction is affected by the perceived impact of an earthquake on a tourism destination, which is in turn affected by tourist risk perception and travel motivation. This finding is based on the empirical study from the perspective of tourism demand. Therefore, the safety of tourists must be ensured, risk perception minimized, and travel motivation increase.

Japan is a country well prepared for natural disasters. In the case study of Japan, the respondent businesses were well prepared in general emergency response planning and drills, but only 40% of these businesses reported having evacuation guidance for foreign tourists. They were unsure of the earthquake preparedness of their community, council, central government, and country. However, communication needs to be improved. According to the literature review and SEM on the collected data, earthquake preparedness is directly impacted by disaster preparedness, which is affected by threat knowledge. The postal survey results also showed that respondent managers also worry about having insufficient personnel, apart from the decline in tourist arrivals, in the aftermath of a major earthquake.

The corresponding propositions are put forward to promote tourism resilience and adaptation from tourism demand and supply. This study provides practical solutions for the preparation for future earthquakes from the perspective of current national conditions by conducting surveys.

7.2 Overall findings of the study

7.2.1 Contribution toward disaster management studies

Disaster management studies often focus on exploring strategies to reduce damage to

local life and property from disasters. This study provides new insight into how to deal with tourism businesses and tourists when large-scale disasters occur.

7.2.2 Contribution toward tourism studies

In tourism studies, tourism economics, marketing, and planning are topics of high interest. Few studies paid attention to the impact of disasters on tourism and tourism disaster management until the 9/11 terrorist attacks in 2001. However, the current studies concerning disasters seldom deal with huge earthquakes, and current tourism disaster management frameworks are more similar to general disaster management models. This study enriches the topic of the impact of disasters on tourism and offers a new perspective on tourism disaster management on the basis of the tourism industry and tourism disaster management.

7.2.3 Contribution toward tourism earthquake disaster preparedness

Compared with other disasters, such as terrorist attacks and infectious diseases, earthquakes have received considerably less attention. This study explored the impact of huge earthquakes on tourism demand and surveyed tourist perception in Sichuan in China after the 2008 Wenchuan Earthquake and tourism sector preparedness in Japan after the Great East Japan Earthquake. Proposals from the perspective of tourism demand and supply are proposed to promote resilience for future earthquakes, both for less- and well-prepared countries in managing disasters.

7.3 Discussion

7.3.1 Uniqueness of the tourism industry

7.3.1.1 Tourist flow

Tourism comprises leisure activities with many purposes other than for work or study, and safety and security are prerequisites in choosing a tourism destination. Meanwhile, tourism destinations with high substitutability in tourism demand face heavy competition for visitor arrivals. As such, inbound tourism demand is more significantly impacted by external shocks. This study demonstrated that damaging earthquakes significantly affect tourism demand, especially inbound demand. Compared with the figures for domestic tourists, those for inbound tourist arrivals rebound slowly. The most plausible reason for these phenomena is the high substitutability of tourism destinations; that is, tourists may avoid risk and choose alternative destinations. However, a lack of information communication may also be a factor. Finally, visitor reduction would affect tourism

businesses in the various destinations, even the entire locale of the destination, through a cascade effect. Policymakers should thus pay more attention to earthquake disasters in earthquake-prone destinations. From this point, the main disasters that impact tourism demand in earthquake-prone regions need to be explored and compared. The results indicated that the first three to five months after the occurrence of a serious earthquake represent the worst losses to the industry. Subsequently, tourist arrivals rebound in a fast recovery process. Time is needed to achieve the normal level. This process covers the periods of sharp decline, rapid rebound, and then wandering.

7.3.1.2 Disasters

By comparing the main damaging disasters that impact tourism demand in earthquake-prone regions, this study found that not all disasters significantly impact tourist flow. Devastating earthquakes most significantly affect inbound tourism demand, based on the case study of Japan. Safety factors and uncertainty of earthquakes may account for the results. This study hopes to shape the understanding of researchers and policymakers as regards destinations and the impact of large-scale earthquakes, and then pay more attention to damaging earthquake disasters. Meanwhile, other issues are raised, such as how tourism destinations, mainly tourism organizations and tourism sectors, prepare for predicted huge earthquakes, which would happen in the near future in Japan, and whether they have measures to protect tourists from earthquake disasters.

7.3.1.3 Tourists

Word of mouth plays a critical role for tourists in choosing tourism destinations. This finding is based on the face-to-face structural interviews, in which most of the respondents conveyed that the main destination-related information they considered were shared by family members, relatives, or colleagues. This outcome coincides with another characteristic of tourism: tourism products (mainly tourism experience) are almost produced and consumed simultaneously and at the same place and time. The product cannot be on trial in advance. Thus, apart from potential tourists, current tourists in the recovery period are also of great concern. The results also showed that tourist satisfaction is significantly impacted by perceived damage, which is affected by risk perception and travel motivation. The findings provide new insights in tourism recovery from the perspective of tourism demand.

7.3.1.4 Destination

In the survey results, managers reported extreme worry about the lack of employees after the occurrence of large earthquakes, on top of the decline in tourist arrivals. The other two characteristics, namely, labor-intensiveness and seasonality, may be attributed for the large percentage of part-time staff employment in tourism sectors. The tourism industry is labor intensive, requiring substantial human labor to provide services.

However, after huge disasters, the available staff may become insufficient, thereby impacting business recovery. Moreover, in most of the respondent businesses, part-time employment takes up a large percentage. This key issue has hardly been discussed in previous literature and remains a difficult topic. Future tourism disaster management planning should also consider this issue.

This study also found that most respondent businesses have a certain level of disaster preparedness, including earthquakes, but had done little for tourists and less for foreign ones, mainly owing to the latter's short stay and number.

7.3.2 Uniqueness of tourism disaster management

7.3.2.1 Tourism demand

Recovery patterns should be considered in developing recovery strategies because effect and recovery durations have their own characteristics. For example, in the sharp decline period, destination restoration should be put first, as too much marketing promotion may be counterproductive. In the recovery period, proactive marketing strategies are recommended. As safety and security are priority issues, critical points in the event of a huge earthquake include helping tourists evacuate and return home; these items should be included in tourism crisis management planning. Further, tourists represent the core of the tourism system; therefore, tourist perception, which may influence decision making as regards potential tourism demand, should also be considered, as word of mouth plays a critical role in tourism. More case studies are expected to verify the characteristics of recovery patterns.

In the aftermath of an earthquake, tourist perception contributes to marketing strategies. Risk perception and travel motivation indirectly impact tourist satisfaction, which is another important point. In relation to this point, helping tourists in their travel, especially in the case of inconveniences caused by damage or during the recovery period, is recommended, as their positive evaluation is more credible than advertisements. The results also suggested measures for reducing risk perception and increasing travel motivation, taken from the case study of Sichuan.

As tourists are usually more vulnerable to disasters than residents (Burby and Wagner, 1996; Drabek, 1992, 1995; Takamatsu, 2011), and tourist casualties would negatively affect the image of a tourism destination, they must be prioritized in the event of huge earthquakes; helping them evacuate and return home safely are critical issues seldom discussed in previous studies (Faulkner, 2001). Japan, which is well-prepared against disasters, has undertaken minimal preparedness for tourists. More work should be done for tourists, such as providing multi-language evacuation maps.

7.3.2.2 Tourism supply

Unlike general disaster management planning, which mainly considers protecting the local people from harm, tourism disaster management should pay much attention to customers or visitors who are not familiar with the locality. From the results, 80.3% of the 324 respondents replied that they offer evacuation guidance for visitors, but nearly 60% of the 322 respondents indicated they did not have evacuation guidance for foreign tourists. As noted by a number of interviewees from tourism organizations, assisting foreign visitors is crucial because most of them may have difficulty communicating with locals. This point is suggested to be emphasized in a tourism disaster framework.

Threat knowledge impacts disaster preparedness, which directly affects earthquake preparedness. Several propositions are put forth. The findings would benefit government policymakers in promoting earthquake preparedness, particularly in earthquake-prone tourism destinations.

Contrary to the results of many previous studies (Paton et al., 2000; Cliff and Morlock, 2009), this study found that risk perception is not associated with disaster preparedness.

Meanwhile, employment is an important aspect of tourism supply. The industry hires a large proportion of part-time staff, and losses in this regard would be a serious problem that would affect business continuity in the recovery process. Launching business continuity planning would be helpful in this issue. According to the results, only 18.4% of the respondent businesses had a business continuity plan, which includes human resource allocation and emergency response (Hayashi, 2003, p.164).

7.3.3 Japan and China

7.3.3.1 Japan

Inbound tourism was significantly impacted by the Great East Japan Earthquake. Experts estimate that several large earthquakes would occur in the near future. Preparedness in the tourism industry is thus urgent.

The survey results showed that tourism sectors are well prepared in facing disasters. However, tourism businesses were deficient in preparedness for foreign tourists and employee participation. For the former factor, earthquake preparedness for the tourism industry should consider the characteristics of tourism to include means to secure the safety and security of tourists. Workshops are recommended to improve the participation of employees.

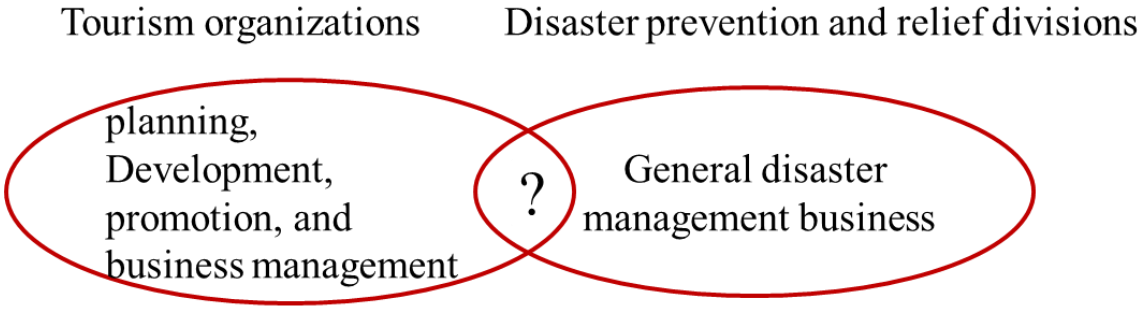
7.3.3.2 China

Inbound tourism was more significantly impacted by damaging earthquakes, compared with domestic tourism, in the case study of Sichuan in China. As word of mouth plays an important role for tourists in choosing tourism destinations, tourist satisfaction becomes important. Travel motivation also indirectly impacts tourist satisfaction, apart

from tourist risk perception. Satisfaction may be impacted by other factors that need to be explored in future studies.

7.3.3.3 Responsible stakeholder

Currently, tourism organizations are mainly responsible for the tourism component "catalyst, planning, development, promotion, and business management." Disaster prevention and relief divisions are responsible for general disaster management. The person responsible for tourism disaster management is also worth discussing.



7.4 Future study

This study explored the disaster preparedness of a well-prepared country in terms of disasters occurring in tourism destinations at a high risk from seismic activity, viewed from the tourism supply side. In addition, this research investigated the case of less-prepared China from the perspective of tourism demand. Based on the survey results, this work offered propositions for corresponding destinations and suggestions for current research. The authors plan to work on related issues for both countries, as shown in Table 7-1. This study hopes to provide valuable references for tourism disaster management and new insights for research on tourism disaster management.

Table 7-1 Future study topics

Cases	Have explored	To explore
Japan **Disaster-well-prepared**	Strategies from **tourism supply**	Strategies from **tourism demand**
China **Disaster-less-prepared**	Strategies from **tourism demand**	Strategies from **tourism supply**

This study mainly discussed earthquakes and tourism, and then provided propositions for the tourism industry. The ultimate aim is to develop tourism earthquake management planning on the basis of the findings in this study.

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Appendix

Appendix 1

游客对四川地震后旅游受灾情况感知调查

尊敬的游客朋友：

您好！本人是京都大学防灾研究所的一名旅游灾害管理方向博士研究生。为了更好地了解地震灾害对四川旅游业的影响，进一步了解您对地震灾后对四川旅游的感知，提高旅游业的灾害应变能力和管理水平，希望能占用您几分钟时间来帮我我们完成这份问卷。本次问卷仅为学术研究所用，采取不记名方式，您提供的信息我们会绝对保密，您敬请放心。感谢您对本次调查问卷的支持。

再次感谢您的合作，祝您旅途愉快。

2013 年 8 月

第一部分：被调查者基本情况

1、性别： ☐ 男 ☐ 女

2、年龄： ☐ 18 岁以下 ☐ 18—25 岁 ☐ 26-35 岁 ☐ 36-45 岁
☐ 46—55 岁 ☐ 56—65 岁 ☐ 65 岁以上

3、职业： ☐ 行政机关 ☐ 事业单位 ☐ 企业 ☐ 自由职业者
☐ 学生 ☐ 其他

4、受教育程度：☐ 中学以下 ☐ 中学或中专 ☐ 大专 ☐ 本科
☐ 硕士及以上

5、个人月收入：☐ 1500 元以下 ☐ 1500-2500 元 ☐ 2500-3500 元
☐ 3500-5000 元 ☐ 5000 元以上

6、您的居住地： ☐华北地区（北京市、天津市、河北省、山西省、内蒙古自治区）
☐东北地区（辽宁省、吉林省、黑龙江省）
☐华东地区（上海市、江苏省、浙江省、安徽省、福建省、江西省、山东省）
☐华中地区（河南省、湖北省、湖南省）
☐华南地区（广东省、海南省、广西壮族自治区）

□西南地区（重庆市、四川省、贵州省、云南省、西藏自治区）

□西北地区（陕西省、甘肃省、青海省、宁夏回族自治区、新疆维吾尔自治区）

第二部分：问项

7、您本次的出游方式是：

□自由行 □ 自驾者出游 □旅行社组团出游 □其他：_____

8、您是第几次来来四川旅游？

□ 初次 □以前来过 □本地人

9、您来四川旅游目的是

□ 休闲度假 □ 商务出差 □ 探亲访友 □ 观光游览 □ 增长知识

□ 强身健体 □ 参观震后遗址 □ 为灾后恢复做贡献

□ 其他：_____

10、您在本次旅游中主要游览的景区有(可多选)

□乐山大佛 □九寨沟 □都江堰 □青城山 □ 峨眉山

□卧龙自然保护区 □成都市内景区 □其他：_____

11、今后在旅游目的地选择方面你会：(可多选)

□以后不会再来四川旅游 □短期内不会考虑来四川旅游

□将会再次考虑来四川旅游 □将会向亲友们推荐来四川旅游

12、您对以下风险持有什么态度？请在您认为选项方框内画“√”。

项目	很低	低	一般	高	很高
流行性疾病(如 2003 年 SARS)发生的可能性					
恐怖袭击(如 2013 年 6 月 26 日新疆鄯善恐怖袭击事件)发生的可能性					
大型自然灾害(如 2008 汶川地震，2013 雅安地震)发生的可能性					
暴风雨雪等自然灾害发生的可能性					

项目	很小	小	一般	大	很大
流行性疾病(如 2003 年 SARS)危害程度					
恐怖袭击(如 2013 年 6 月 26 日新疆鄯善恐怖袭击事件)危害程度					
大型自然灾害(如 2008 汶川地震,2013 雅安地震)危害程度					
暴风雨雪等自然灾害危害程度					

13、在四川发生两次大地震后，您对以下项目持什么想法？请在您认为选项方框内画“√”。

项目	非常不同意	不同意	不确定	同意	非常同意
旅程变危险					
环境变脆弱					
旅游资源受到很大破坏					
游客数量减少					
旅游交通受震灾影响严重					
个人对此次四川旅游满意					

14、以下关于您来四川旅游动机，您持有哪些看法？请在您认为选项方框内画“√”。

项目	非常不同意	不同意	不确定	同意	非常同意
自然风光优美					
四季分明，气候宜人					
巴蜀文化底蕴浓厚					
四川小吃历史悠久口味独特					
高质量的宾馆和景区					
服务人员服务意识强					
当地人热情好客					
旅游花费低					
四川旅游安心安全					
交通便捷					

为四川灾后旅游恢复做贡献					
对灾后遗迹充满好奇					
对灾后恢复和变化充满好奇					

15、您是通过哪些途径获取旅游信息的？

☐ 互联网查询 ☐ 电视、电台 ☐ 报刊、旅游书籍 ☐旅游宣传册 ☐ 亲友或同事介绍 ☐ 旅行社 ☐ 其他_____

16、您认为四川旅游部门可以从以下方面着手恢复旅游市场(可多选)

☐ 四川旅游开展促销降价活动

☐ 开发地震遗迹旅游，满足游客好奇心理

☐ 提供更好的服务质量

☐ 加强旅游设施防震等安全保障，消除游客不安心理

17、您对震灾后四川旅游业的发展有哪些建议或意见

_____

_____

_____

_____

我们的调查问卷到此结束，再次祝您旅途愉快！

Appendix 2

首都直下地震による宿泊・飲食施設の備えに関する調査

ご協力のおねがい

拝啓

この度、京都大学 防災研究所巨大災害研究センターでは、首都直下地震による観光業の防災準備や災害認知等を把握し、今後の観光業について危機管理対策の検討に役立てるため、本調査を企画いたしました。 首都圏で宿泊施設とレストランを経営にしている皆様のお考えをお答え下さい。

ご回答いただいた結果はすべて数字になおし、統計数字としてのみ使用いたしますので、回答していただいた貴宿泊施設あるいは貴レストランを特定できる情報が外部に漏れてご迷惑をおかけすることは、決してございません。

ご多忙のところ誠に恐縮ではございますが、本調査の趣旨をご理解いただき、本調査にご協力いただきますようお願い申し上げます。

敬具

■ 本調査は京都大学防災研究所巨大災害研究センターが実施し、呉麗慧が博士後期課程 2 年生、実査作業を担当します。

■ ご回答は、「施設管理ご担当の方」に施設としての回答をお願いいたします。

■ ご記入方法につきましては、裏面の「記入にさいしてのお願い」をご覧ください。

■ ご回答いただいた調査用紙は、2014 年 3 月 31 日（月）まで に同封の返信用封筒に入れて投函していただくようお願いいたします。切手は不要です。

調査に関する問い合わせ先
京都大学 防災研究所巨大災害研究センター林研究室
担当：呉　麗慧
メール：wulihui@drs.dpri.kyoto-u.ac.jp

＊＊＊ 記入にさいしてのお願い ＊＊＊

■ご回答は、各質問に沿って、（○は１つだけ）、（○はいくつでも）などの表記に従ってあてはまる数字を○で囲んでください。また、「その他」に○をつけた場合は、その内容などを具体的に記入してください。

■この調査は、首都圏のホテル、旅館、簡易宿所、会館等の宿泊施設とレストランを対象としています。複数の宿泊施設を経営されている場合は、調査票をお送りした施設についてお答えください。

■宿泊施設のタイプについて、以下標準にご参考ください。

○旅館…和式の構造及び設備を主とする施設を設け、宿泊料を受けて、人を宿泊させる営業で、簡易宿所以外のものをいいます。

○ホテル…洋式の構造及び設備を主とする施設を設け、宿泊料を受けて、人を宿泊させる営業で、簡易宿所以外のものをいいます。

以下の定義により３種類に分類しています。

①リゾートホテル…ホテルのうち行楽地や保養地に建てられた、主に観光客を対象とするものをいいます。

②ビジネスホテル…ホテルのうち主に出張ビジネスマンを対象とするものをいいます。

③シティホテル…ホテルのうちリゾートホテル、ビジネスホテル以外の都市部に立地するものをいいます。

○簡易宿所…宿泊する場所を多数の人で共用する構造及び設備を主とする施設を設け、宿泊料を受けて、人を宿泊させる営業のものをいいます。

○会社・団体の宿泊所…会社・団体の所属員など特定の人を宿泊させる営業のものをいいます（会員宿泊所、共済組合宿泊所、保養所、ユースホステル、会館など）。

※ 民宿、ペンションなどを運営・管理されている方は、旅館業法に基づく許可証等を確認いただき、ホテル、旅館又は簡易宿所に分類してください。

■外国人宿泊者について、以下標準にご参考ください。

○外国人宿泊者…日本国内に住所を有しない宿泊者をさします。ただし、日本国内の住所の有無による回答が困難な場合は、日本国籍を有しない宿泊者を外国人宿泊者として回答してください。期間中一人もいない場合には、明示的に０人とお答え下さい。

問１地震災害リスク認知と首都直下地震（マグニチュード 7.3 の東京湾北部地震）被害想定について伺います。

１－１　以下のリスクが発生するとき、貴方が住んでいる地域に与える影響についての可能性をお答えください。（それぞれ○は１つずつ）

	とてもありそうにない	ありそうにない	よくわからない	ありそうな	大いにありそうな
洪水	1	2	3	4	5
干ばつ	1	2	3	4	5
暴風雨	1	2	3	4	5
竜巻	1	2	3	4	5
地震	1	2	3	4	5
津波	1	2	3	4	5
火山	1	2	3	4	5

１－２－１　大規模な被害がでる地震を経験したことがありますか。（○はひとつだけ）

1.　はい
2.　いいえ

１－２－２　また、１－２－１で、「はい」を選択された場合、地点と発生年を　□
にご記入ください。

１．地震が発生するところ　□
２．何時　□　年

１－３ 次の首都直下地震がいつ発生するとお感じですか。（○はひとつだけ）

1.　１年以内　　２．　１０年以内　　３．　３０年以内
４．　５０年以内　　５．　５０年以降　　６．　よくわからない

１－４次の首都直下地震はどんな脅威を引き起こすとお思いですか。（それぞれ○は１つずつ）

	まったく賛成できない	賛成できない	どちらとも言えない	賛成できる	大いに賛成できる
首都直下地震は被害が大きいすぎで、備えることはできない。	1	2	3	4	5
地震が発生した場合の対応な行政の仕事であり、自分と勤め先は地震に備える必要はない。	1	2	3	4	5
地震の備えをすることで勤め先と仕事に与える影響を減少できる。	1	2	3	4	5
地震の備えをすることでビジネスが災害からの回復が促進される。	1	2	3	4	5

１－５　以下内容について、貴方は賛成ですか、反対ですか。該当箇所にご記入ください。（それぞれ○は１つずつ）

	影響がなし	影響が弱い	不確か	影響がある	影響が強い
自分の安全	1	2	3	4	5
貴方の家族	1	2	3	4	5
貴方の個人財産	1	2	3	4	5
勤め先	1	2	3	4	5
住んでいる区市町村	1	2	3	4	5

１－６　想定される首都直下地震によって貴宿泊施設或いはレストランで発生すると考えられる問題は何ですか。

（○はいくつでも、ほかの問題があれば、ご記入ください）

１．社会基盤の被害　例えば道路被害
２．建物の被害
３．ライフラインの停滞　例えば水、電気、下水路、電話サービス
４．交通遮断
５．訪問客が減少になること
６．二次被害　例えば火災
７．緊急対応　例えば避難
８．復旧　例えばゴミ処理、瓦礫処理
９．風評被害
１０．他の問題

問２　災害時、予防力と回復力向上のための対策について伺います。

２－１－１　被害軽減のため、措置や検討があるかどうか、該当箇所にご記入ください。（それぞれ○は１つずつ）

	はい	どちらとも言えない	いいえ
１．　貴社には応急対応計画がありますか。	1	2	3
２．　貴方は区市町村から地震情報を受け取りますか。	1	2	3
３．　貴方は予防について、誰と検討していますか。			
３．１　貴方の家族	1	2	3
３．２　近隣の人たち	1	2	3
３．３　ほかの会社オーナー	1	2	3
３．４　同僚	1	2	3
４．５　区市町村	1	2	3

２－１－２　２０１４年３月１５日まで、防災訓練に参加することがありますか。（○はひとつだけ）

1.　はい
2.　いいえ

２－２－３　また、２－1－２で、「はい」を選択した場合、訓練の名称を［　　］にご記入ください。

２－１－４　また、２－１－２で、「はい」を選択した場合、その訓練は貴宿泊施設あるいはレストランの防災対策に役立ちましたか。（○はひとつだけ）

1.　はい
2.　いいえ

２－１－５　首都直下地震発生すれば、被害を減らすために、だれが責任を負いべきとお考えですか。以下の選択肢の中から選び、優先順位が高い順に枠内に 番号をご記入ください。

優先順位１番目→［　］　優先順位２番目→［　］　優先順位３番目→［　］　優先順位４番目→［　］　優先順位５番目→［　］　優先順位６番目→［　］

＜選択肢＞

１．自分の責任　２．会社の責任　３．地域の責任
４．区市町村の責任　５．都道府県の責任　６．国の責任

２－１－６　想定の首都直下地震の被害を減らすために、以下の主体が準備することをどうの感じですか。（それぞれ○は１つずつ）

	なんでも準備しない	少し準備した	不確か	準備した	十分に準備した
自分	1	2	3	4	5
住んでいる地域	1	2	3	4	5
勤めている会社	1	2	3	4	5
区市町村	1	2	3	4	5
都道府県	1	2	3	4	5
国	1	2	3	4	5

２－１－７　貴宿泊施設レストランには新しいスタッフのための新任研修プログラムがありますか。

1.　はい
2.　いいえ

２－１－８　２－１－７で、「はい」の場合には、研修プログラムには自然災害対応を含みますか。

1.　はい
2.　いいえ

２－１－９　緊急時、スタッフが何をすべきかについての訓練がありますか。

1.　はい
2.　いいえ

２－１－１０　貴宿泊施設或いはレストランは避難訓練を実施していますか。

1.　はい
2.　いいえ

２－１－１１　災害発生時、被害を減らすため、貴宿泊施設或いはレストランは自然災害による事業中断保険をかけていますか。

1.　はい
2.　いいえ

２－１－１２　２－１－１１で、「はい」の場合、保険の適用範囲をご記入ください。

２－１－１３　貴宿泊施設或いはレストランには防災計画書がありますか。

1.　はい
2.　いいえ

２－１－１４　２－１－１３で「はい」の場合、計画書を添付にいただけますか。

1.　はい
2.　いいえ

２－１－１５　災害時、宿泊客への避難誘導対策がありますか。例えば宿泊者への避難地図。

1.　はい
2.　いいえ

２－１－１６　災害時、外国人宿泊客への避難誘導対策がありますか。例えば外国語での避難説明。

1.　はい
2.　いいえ

２－２－１　想定の首都直下地震が貴宿泊施設或いはレストランに与える影響について、どのようにお考えですか。　（それぞれ○は１つずつ）

	全く思わない	思わない	どちらと思わない	思う	必ず思う
震災後、従業員はお互いに助け合う。	1	2	3	4	5
早急に復旧できる。	1	2	3	4	5
大震災後、ほかの従業員に面倒を見ることは自分の責任である。	1	2	3	4	5
震災後数月間、お客様が減少する。	1	2	3	4	5
私たちの会社は震災に対して、十分に準備している。	1	2	3	4	5
首都直下地震後、私たちの会社が存続できるかどうか心配している。	1	2	3	4	5

２－２－２　首都直下震災後、貴宿泊施設或いはレストランがいつ再開できるとお考えですか。

１．即日　　２．1～2 週間以内　　３．2～4 週間以内　４．1～3 ヶ月
５．3～6 ヶ月　　６．6 ヶ月以降　　７．倒産

２－２－３　貴宿泊施設或いはレストランには災害時事業継続のための計画がありますか。

1.　はい
2.　いいえ

問３　貴宿泊施設或いはレストランと貴方につてお伺いします。

３－１　貴宿泊施設或いはレストランが所在する区市町村をご記入ください。

３－２　宿泊施設のタイプ について、該当箇所にご記入ください。（○は一つだけ）

１．旅館
２．リゾートホテル
３．ビジネスホテル
４．シティホテル
５．簡易宿所
６．会社・団体の宿泊所
７．　その他、ご記入ください　［　　］

３－３　貴宿泊施設建物の建造年分、階数、客室数及び収容人数（平成２６年３月１５日現在）について、ご記入ください。

建物の建造年分　［　　］年

階数　［　　］階

客室数　［　　］室

収容人数　［　　］名

３－４　貴宿泊施設或いはレストランの資本金（平成 ２６ 年 ３ 月時点）をお答えください。（○は 1 つだけ）

１．1,000 万円未満
２．1,000～3,000 万円未満
３．3,000～5,000 万円未満
４．5,000 万円～1 億円未満
５．1～3 億円未満
６．3～10 億円未満
７．10～100 億円未満
８．100 億円以上

３－５　最近 1 年間に訪れた宿泊者の宿泊目的と国籍を延べ人数で見たおおよその割合（例えば、20%，30%）でご記入ください。

宿泊目的
A.　観光レクリエーション　［　　］%
B.　出張・業務出張・業務　［　　］%
C.　研修　［　　］%
合 計　100%

国籍
A.　日本人　［　　］%
B.　外国人　［　　］%
合 計　100%

３－６　従業者数（平成２５年１月１日現在）について、貴宿泊施設或いはレストランで就業しているすべての人（臨時雇用者、他からの派遣を含む）を記入してください。

正社員		名
臨時雇用者		名
その他		名

３－７　貴方の年齢について、お答えください。

１．20 以下　　２．21～45　　３．46～65　　４．66 以上

３－８　勤め先年数について、お答えください。

１．1 年未満　　２．1～2 年
３．3～5 年　　４．6～10 年
５．11 年以上（11 年を含む）

３－９　貴方の最終学歴（中退は卒業に含む）は

１．中学卒･ 高校卒
２．短大･･･高専･ 専門学校卒
３．大学･ 大学院卒

ご多忙の中、ご回答いただき誠にありがとうございました。

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