A Basic Study on Residents' Recognition and Protective Behavior in Promoting University – Community Collaboration for Disaster Risk Reduction

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1. Important Roles of University in Response to Mass Disaster

The Great East Japan Earthquake that occurred on 11th March, 2011, left the unprecedented damage on Japan. Not only facilities built against tsunami (hard measure or structural measure) could not protect residents and cities from devastating tsunami, but also soft (non-structural) measures such as evacuation behavior that must have been trained in disaster trainings could not work in many situations. As a result, tsunami flew over and even broke coastal levees and pushed away many buildings as well as human lives. We need to apply lessons that were learned at the cost of mass victims to future disaster risk reduction.

One of the lessons learned in the Great East Japan Earthquake was important roles of universities located in the affected areas (Kanegae, et al. 2012). Some universities took an important role as shelters for the victims and bases of disaster response. In addition, as Kameyama (2011) put it, the case of *Ishinomaki Senshu University* that had effectively worked as a base for disaster response as well as a shelter after the Great East Japan Earthquake, told us that such effectiveness stemmed from collaboration in normal days between the university and *Ishinomaki City*. When the earthquake occurred, they were about to make the agreement for collaboration for mass disaster. They had the draft agreement so that the university could proficiently contribute as a base according to the draft agreement. To expand potentiality of universities to contribute to effective disaster response, it is essential to focus on collaboration between universities and other actors in normal days. University roles in disaster response have been paid attention to since then; however, few studies have been implemented for promoting the university response from the normal days, that is, preparedness, with other actors against disaster.

Against the background above, this study aims to construct basics for promoting university response with other actors. Izadkhar and Hosseini (2010) and Ye, et al. (2012) mentioned

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that community[1)] among other actors is the first responder to disaster. Thus community is the first actor who would need support from other actors. As a basic study on promoting the university response with other actors, this study focuses on collaboration between university and community and aims to find important factors within community for promoting university response activities to disaster. Specifically, the goal of this study is to describe the significant relations between residents' recognition and protective behaviors that influence on willingness to pay for supporting the activities, which leads to sustainable collaboration between university and community.

To do so, chapter 2 introduces the important roles of universities for disaster risk reduction and three activities that universities should implement for communities against disaster based on three disaster phases. Chapter 3 indicates basic elements of the community that the study focuses on, and then chapter 4 identifies basic elements of the community that promote university response activities and suggests a hypothetical reason imbedded in the promotion.

2. University – Community Collaboration for Disaster Risk Reduction

2.1 University – Community Collaboration

Countries from more than half world have seen the severity of many kinds of disaster. This study, as indicated in the prior chapter, focuses on disaster that recently has significant trend to more frequently occur than ever. As governments in each disaster – prone countries try to invest on measures against disaster for protecting their citizens; local people also try to develop their capacity to cope with disaster. In addition to individual actors' efforts to cope with disaster, it is important to find ways to combine the efforts and create synergy effects from the combination.

United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) expressed from its practice in enhancing community resilience[2)] to disaster that "no one stakeholder, a government agency or non – government organization, can effectively take on the task of reducing disaster risks alone. Disaster risk reduction calls for a multi – sector and multi – stakeholder approach. Therefore, in building community resilience to natural hazards, partnership – building among stakeholders at all levels, local, national and regional, is essential and fundamental[3)] (UNESCAP 2008b: 7)". In addition, from work that National Research Council (NRC) of the USA has put much effort on, projects of private – public sector collaboration to enhance community disaster resilience implied that for communities to find the appropriate collaborative networks, communities must look into the need of their specific resources (UNESCAP 2008b: 7). Thus, individual efforts and connection between/among them are necessary two wheels that are vital to advance vehicles of disaster risk reduction.

With focus on roles of universities and its resources and future potentiality, this study proposes a new concept to better utilize universities involving fighting with disaster, which is not for the universities itself only, but also for the society. Even though the fundamental role of universities is to

provide higher education to the society, universities generate more than educational knowledge and provide more experts/professionals to fields in need due to the growing importance of Corporative Social Responsibility (CSR), whose application in the last decade has expanded beyond the business sectors up to the educational institutions. Accordingly, this study proposes the utilization of university resources as claimed by National Research Council of the National Academies of the USA (National Research Council of the National Academies 2012).

One example of raising university efforts and making combination stronger can be seen in Tohoku University that is located on the affected areas of the Great East Japan Earthquake. It has founded the International Research Institute of Disaster Science (IRIDeS). “The IRIDeS will contribute to on-going recovery/reconstruction efforts in the affected areas, conducting action-oriented research, and pursuing effective disaster management to build sustainable and resilient societies. … Enhancing the cooperation with the local municipalities and governments in the affected areas, and contributing to their recovery and reconstruction efforts, the IRIDeS conducts the action-oriented research (IRIDeS 2011).” The IRIDeS is a more comprehensive institute than others to cope with disaster. The institute includes researchers on medical science, information management and public collaboration as well as natural, human and social science[4)].

As mentioned earlier, this study focuses on collaboration between university and community, rather than collaboration with local municipalities and governments underlined by IRIDeS. When it comes to the main theme of this study, considering about utilizing urban resources for support to communities, universities are the best out of all urban facilities. University resources are plentiful and useful for providing support to local communities. Comparing universities with other facilities in cities, universities have more advantages and fewer weaknesses to develop its usefulness for mutual support with communities. Moreover, the structure of universities is well-organized and close to the organizational system of business enterprises. University resources have been classified into two main elements. The first element is physical elements such as universities’ infrastructure and it could be divided again into smaller elements as “Utility and Facility”, comprising both goods and services. Utility refers to water supply, electricity, drainage system, and so on, meanwhile facility refers to multimedia rooms, gymnasiums, pocket parks, open space, fire extinguishers, and so on. The second element is social elements that refer to “Human Resources,” which is assembled in universities and includes all workers or employees in the universities such as students, university staffs, professors, and so on, who are full with knowledge as repositories and expertise. These elements without saying contribute to the community safety.

Moreover, work done by Wiewel W. and Knaap G. J. (2005) on the challenge of University – Community Collaboration for smart growth city[5)], confirmed that:

Universities have become one of the major institutions addressing metropolitan

development policy issues. Driven in part by the severity of urban problems, as well as increased calls for accountability and 'engagement,' institutions of higher education have started to play active roles in bringing their intellectual and institutional resources to bear on their immediate environment. … Regardless of their particular missions, universities are integral parts of their larger communities. As such, they occupy space, shape the character of neighborhoods, and participate in public policy decision making. University can help implement smart growth on campus, in the surrounding neighborhoods, and in the larger communities that they are intended to serve. Collaborative efforts have been equally effective in promoting smart growth principle. Universities are large, complex institutions. In many places they are among the largest employers in the community; in most places, they are communities unto themselves. Yet universities and their administrative units must collaborate with external organizations to succeed (Wiewel and Knaap 2005: 4 - 13)."

Unavoidably, it is necessary for universities to concern about collaboration with other actors. Rather than local governments or non – profit organizations, this study emphasizes the collaboration between university and community, as community is the first responder to disaster and first actor who need support as underlined in the previous chapter.

2.2 University Activities for Disaster Risk Reduction

In order to promote University – Community Collaboration for disaster risk reduction, this section specifies additional functions of universities to reduce disaster risk as much as possible according to the disaster phases: pre-disaster, during-disaster and post-disaster. These activities are to be introduced to universities to start giving service to communities as a part of university CSR.

Pre-disaster phase: Firstly and probably the most important point is that the needs to understand the disaster profile in the areas. The information related disaster in general, such as how severe of the disaster is, when it would occur, and how to prepare and survive in disaster, need to be learnt by communities. Therefore, in this phase of disaster, universities are expected to disseminate disaster information, at least information related evacuation routes, places and principles.

During-disaster phase: Recently, most of the local people from disaster-prone areas has tried to protect their own life, properties and assets when disaster strikes. However, it is important, community-self protection could not be used without assistances. In case that people get injured or lose contact with relatives, the victims will surely need assistances. Universities should implement activities with focus on the scenario such that disaster victims were caught in the middle of evacuation process. Victims need the directions and instructions to take proper actions in evacuating. Universities that are filled with human resources should develop not only their self – protection

activities, but also mutual support systems, especially supported by university students. Thus, university should ponder over programs of developing voluntary systems, based on university students, to prepare for prompt assistance. The voluntary students can play a wide variety of important operational and support roles. During the disaster, the automatic systems may not be functioned probably, resulting from network disruption, which make manual operations crucial rather than usual time. Trained and skilled students who are volunteers could give their hands to execute the systems or machines. The purpose of evacuation is to move people away from actual or potential dangers to safer places. For this to happen safely, what need to be planed is not just alerting people and moving them, but also planning shelters and supporting victims through to their return and recovery. The need for humanitarian and other assistance, particularly to those with special requirements, requires careful consideration and planning. Volunteer students who were trained to be ready in the disaster event could, firstly, protect themselves and assets, and secondly, support the operation needed for the universities to allow and last the continuity systems, and eventually offer the assistants in evacuation processes.

Post-disaster Phase: Disaster can cause a huge damage and destroy everything without which human being faces with difficulty in survive. Full recovery from serious events can take years and will require significant resources involved. By disaster, the basic needs for foods, water, clothes, shelters and medicines were swept away. The first and probably the most important one is the habitat. Without the proper habitat, more serious problems must be induced, such as negative impact on health and mentality. In addition, the living stocks needs to be stored before disaster and orderly managed even after the disaster. Infrastructure such as water, food, medicine and clothes need to be prepared. Universities can help community avoid indirect damages of disaster by preparing infrastructures in universities that contain human basic needs, completed and adequate to shelter the larger numbers of the victim. Since many universities are designated as evacuation places for emergency, universities should prepare infrastructures to serve the need requested by various types of users. It is important to prepare universities not just only as evacuation places but as evacuation centers that respond and deliver the sense of the habitats.

These three activities could be suggested from universities, which cost sometimes much because of requiring some additional facilities, training human resources and so on. Universities could take all burdens, however; their capitals and resources for the activities are beneficial to communities surrounding the universities. In this sense, the capital and resources are local public goods whose values cannot be calculated in the market. One of the established methods to estimate the value is to convert the value to an economically calculable index by asking how much willing to pay communities are for these activities (WTP: Willingness to Pay). This study adopts this methodology to compare the values while admitting a limitation of WTP that it can estimate merely economical values of the activities.

3. Modeling residents' protective behaviors for University – Community Collaboration

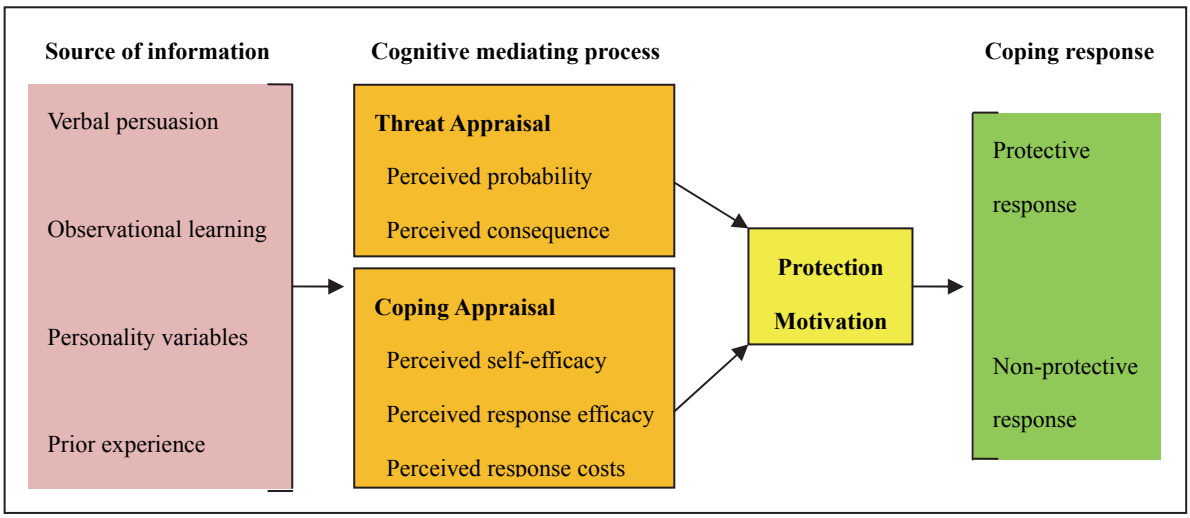
3.1 Concept of protective behavior and its promoting factors

Increasing disaster for a decade has led many experts and governments to focus on disaster preparedness. Disaster preparedness reduces the risk of loss lives and injuries and increases capacity for coping when hazards occur. Considering the value of the preparatory behaviors, governments, local, national and international institutions and non-government organizations made some efforts in promoting disaster preparedness. However, a number of resources have been expended in efforts to promote behavioral preparedness; a common finding in research on disaster is that people fail to take preparation for such disaster (Paton 2003; Shaw 2004; Tierney 1993; Coppola and Maloney 2009). For example, nearly 91% of Americans live with from moderate to high risk of natural disaster, however, only 16% take preparation for the disaster (Liu 2007).

Many studies had been conducted to investigate ways in which people prevent, adjust to, react to and recover from disaster. There are ranges of model study related to disaster preparedness to understand or predict individual protective behavior. Among them is protection motivation theory (PMT), which was developed and revised from fear appeal research by Rogers (1975). The origin of this theory aimed to explain how a fear-arousing communication can change attitudes and, subsequently, change behaviors of individuals. Sources of information that effect on cognitive process leading to protection motivation were also added (verbal persuasion, observation learning, personality, prior experience). Furthermore, protective motivation was referred to for the cognitive mediating process (threat appraisal and coping appraisal) that leads to maladaptive coping.

The model of PMT has been applied to explain decision making and to understand protective behavior in relation to threats as well as natural hazards as well. Bubeck, Botzen, and Aerts (2012) applied the PMT to explain influences of risk perceptions on protective behavior in the context of flood mitigation. The schematic overview of how PMT explains protective behavior of individuals according to specific variables is shown in Figure 1. The model attempts to reflect the main cognitive processes that lead to a protection motivation in response to a specific threat. Two steps of cognitive processes are distinguished: namely, "threat appraisal" and "coping appraisal."

Threat appraisal is composed of the variables "perceived vulnerability" (probability) and "perceived severity" (consequences) that are referred to as risk perception. Once a certain level of threat appraisal is reached, people start to think about the benefits of possible actions and to evaluate their own competence to carry them out. This process is referred to "coping appraisal" that is comprised of the variables "response efficacy," "self efficacy" and "response cost." The effect of threat appraisal and coping appraisal influences an individual's protection motivation, and results in a protective or non-protective coping response.



(Source: Bubeck et al. 2012)

Figure 1. A schematic overview of PMT for individuals' protective behavior

Preparedness action for disaster can widespread in different ranges of activities reflecting the efforts done by community (residents) to reduce the impact of natural disaster. In terms of earthquake, Mulilis-Lipa Earthquake Preparedness Scale established by Mulilis et.al (1990) to assess the level of earthquake preparedness in certain communities has been used globally. This measures, for example, highlighted the importance of disaster kits (medicine, food and water, flashlight, and communication means), having family emergency plan (keeping phone number of family members and emergency unit, and confirming how to evacuate), securing houses and furniture from earthquake shaking (fastening furniture and putting heavy goods in proper way), searching information related to earthquake, and participating in disaster drills. These kinds of item are believed as the basic preparedness that should be adopted by family. There are also other preparedness actions involved in wider activities and wider levels. For instances, in a certain community, cooperation with other stakeholders to engage any activity related to disaster risk reduction is also important.

Consistent with Bubeck's et.al. model, other experts proposed risk perception as an important factor in determining protective behavior (Mulilis et al. 2000). How people perceive to risk is often regarded as an important predictor of people decision to take preparation from natural hazard. Risk perception refers to the likelihood that hazard would happen and the severity of impact to him/her (Ronan, 2010). While the higher level of risk perception can motivate people to take action for preparedness, a low perception decreases adopting preparedness adjustment on disaster. Johnston et al. (1999) identified the important roles of risk perception and level of hazard's knowledge in influencing people to take preparation for disaster.

Past experience of disaster is also an important factor in disaster risk reduction activities (Tierney 1993). People learn from the past disaster how they should do and should not do in

responding the expected disaster. They evaluate what behavior worked and did not work to reduce the impact of disaster affecting them. Experience can also coming from other persons who have experienced disaster, however the first-hand experience is the best to easy recall individuals of the past disaster.

Another factor influencing protective behavior is awareness (Tierney 1993). Past studies on earthquake preparedness and bushfire hazards (Paton et al. 2003) concluded that critical awareness determined people's preparedness. In addition, a positive correlation between public awareness and disaster preparedness is proposed by the University of Colorado Natural Hazards Center (Mulilis et. al 2000). Critical awareness refers to how much individuals think about and discuss a certain hazard (McIvor et al. 2007).

3.2 A Model of Awareness – Protective Behavior of University-Community Collaboration

Building from previous discussion, there are some factors influencing people to take action on disaster preparedness, especially against earthquake, such as awareness, risk perception and experiences on past disaster.

Although preparedness consists of individual, household, community, organizational preparedness; this study focuses on household's preparedness representing adoption of earthquake items adopted by family. As mentioned earlier, the study tries to find relations between household's recognition and protective behavior and their WTP to three activities. Figure 2 depicts the whole model of this study that is tested in the next chapter.

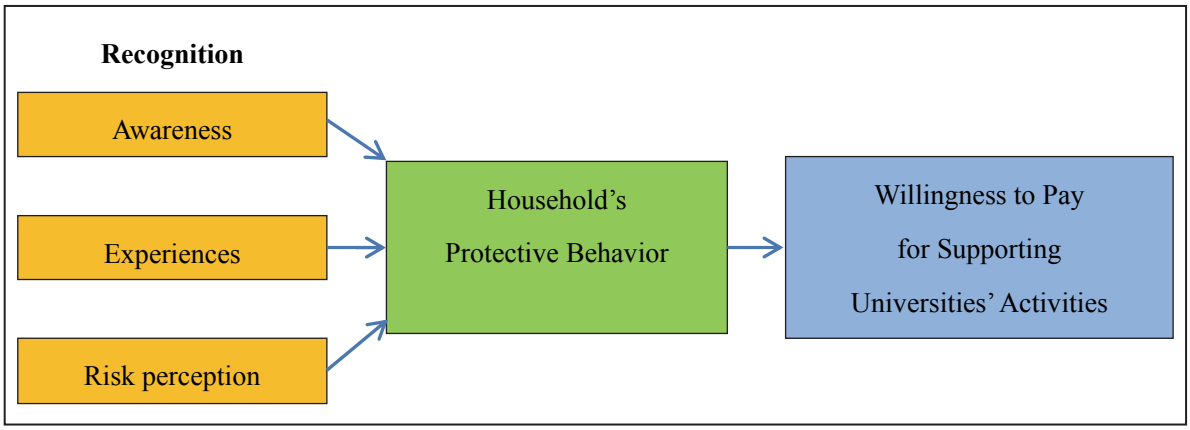


Figure2. Model of causal relations between awareness, experiences, risk perception, protective behavior and willingness to support University's activities

4. Residents' Recognition and Protective Behavior for University – Community Collaboration

4.1 Research Details and Characteristics of the Respondents

This chapter tests the model in the Figure 2 by Path Analysis and shows a hypothesis reasoning the results. Before going to the analysis, it first introduce survey methodology and basic

data gotten such as respondents' attributions, risk perception, experience, awareness, earthquake preparedness and WTP of respondents.

This study set its case study on Kinugasa District (ex-elementary school district), in Kyoto City. Taking an opportunity of participation by the authors in the disaster training held in the district in September, 2011, we distributed 10 questionnaires to each of 36 members of Community-based Disaster Risk Reduction Group (*Jishubosai-kai* in Japanese) of Kinugasa District. The members answered the questionnaires and then distributed the rest of nine questionnaires to their nine neighbors. The members also collected the questionnaires after answering, and we and the leader of Community-based Disaster Risk Reduction Group of Kinugasa District collected them from the members. Out of 360 questionnaires we could collect 168 samples including ones miss some variables (46.7%).

Prior to explaining the results, two challenges that we must overcome are that the questionnaires were distributed not randomly and just a half year after the Great East Japan Earthquake. For the former, this study does not try to find the present situation of the community but it aims to present the significant relations between residents' recognition and their protective behaviors that influence on willingness to pay to support the management of collaboration. Therefore, as long as we get samples with a variety of values in each variable, our goal can be attained. As for the latter, it can be expected that especially respondents' psychological variables would show higher degrees than ones before the earthquake. Nonetheless, if we can get data with enough variances, we would not face with difficulties to analyze and to attain the goal. Therefore, we can assume that these two challenges would not be limitations of the study. Therefore, this section shows basic characteristics of respondents to explain a variety of values in variables.

Among 168, the number of female respondents was more than the one of male (Figure 3). In terms of age, we got many respondents at the age of 40s, 50s and 60s (Figure 4). Many respondents lived in wooden houses (Figure 5). There were many respondents who live alone, with from 1 person to 3 persons (Figure 6). More than 50 percent respondents had family members whose age was less than 12 or over 60 (Figure 7 and 8). In many cases, family members less than 12 or over 60 years old need support during- and post-disaster. Merely 32 respondents belong to Community-based Disaster Risk Reduction Group (*Jishubosai-kai* in Japanese) of Kinugasa District (Figure 9). From these data, we can recognize how socially vulnerable this district to disaster.

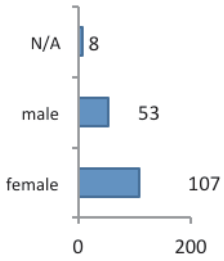


Figure 3. Sex (N=168)

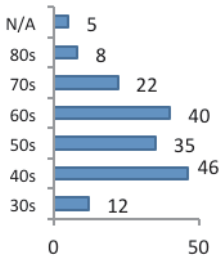


Figure 4. Age (N=168)

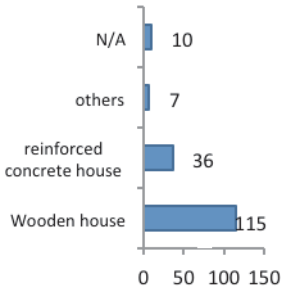


Figure 5. Type of house (N=168)

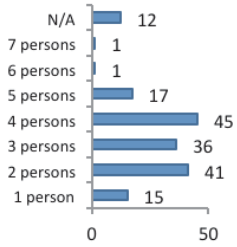


Figure 6. Number of respondents staying together, including respondents(N=168)

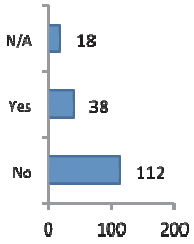


Figure 7. Respondents living with those who are under 12 years (N=168)

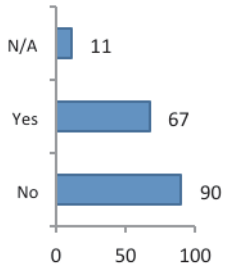


Figure 8. Respondents living with those who are over 60years (N=168)

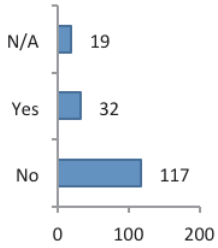


Figure 9. Community-based Disaster Risk Reduction Group member (N=168)

Next, it presents basic analysis on risk perception, experience, awareness, earthquake preparedness and WTP for each activity. As for risk perception, respondents were asked whether they believe that earthquake would occur in Kyoto within 30 years and they chose the degree of risk perception, starting from no; yes, but not dangerous at all; yes but little worry; yes worry; and yes much worry and need to take measures. The number of respondents answered the lowest and highest level of risk perception were almost the same. As for 'yes, much worry and need to take measures' are slightly higher than the ones answering 'no', respectively about 40% and 35% (Figure 10).

In terms of past experiences of disaster, because the last big earthquake occurred almost hundred years ago, we investigated how often they felt danger to their lives or their family's lives from earthquake when they were in Kyoto City. Figure 11 indicates that majority of residents have never experienced earthquake during their living in Kyoto (64%) and 33% reported that they have experienced earthquake once. Only 2 residents experienced more than once.

Critical awareness was measured by asking three questions about how often they think, discuss with their family members and discuss with neighbors about earthquake disaster in Kinugasa District. Figure 12 illustrates that in general residents were hardly thinking about and/or discussing earthquake problem, meanwhile part of respondents think about and/or discuss the threat of hazard more often than one month. Talking with family members is the activity most done by respondents among other two variables.

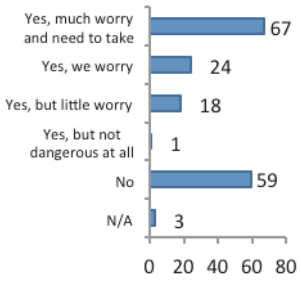


Figure 10. The level of risk perception to probability of earthquake occurrence (N=168)

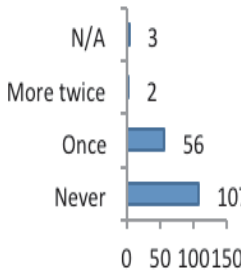


Figure 11. Residents' experiences of earthquake (N=168)

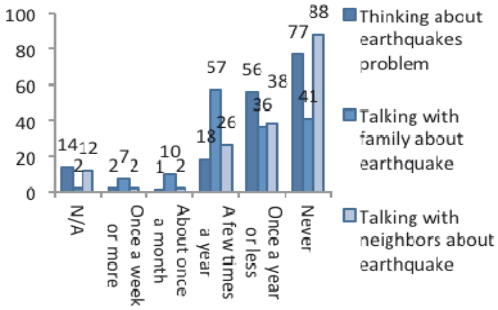


Figure 12. Frequency of residents who think about and discuss earthquake (N=168)

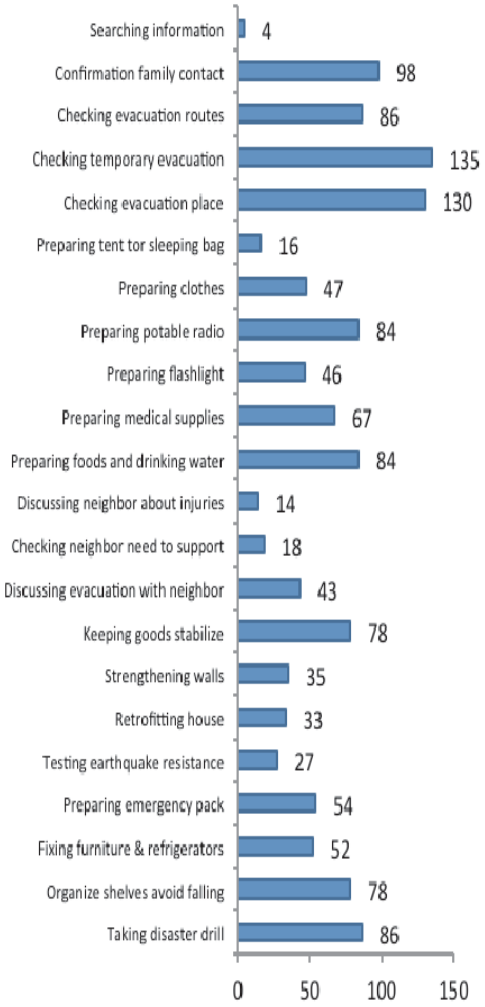


Figure 13. Frequency of residents who do each earthquake protective behavior (N=168)

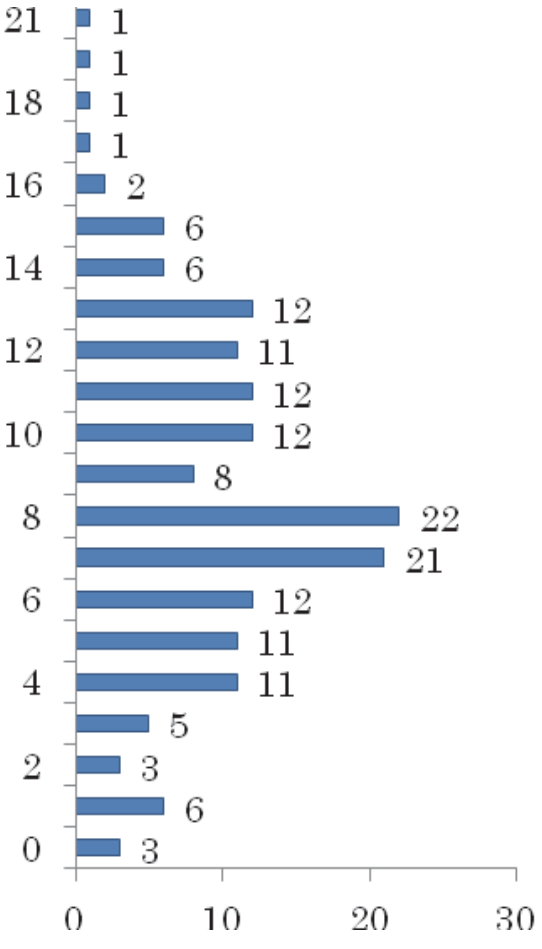


Figure 14. Frequency of residents' protective behavior scor (N=168)

Figure13 presents how many respondents take each action on preparedness. They were asked whether they do measures against earthquake and answered by checking 22 items. In general only eight preparedness items have been done by more than 50% of respondents. The measure done by them most was to prepare flash light (87%), checking temporary evacuation (80%) and checking a shelter place (77%) in order. Other items are checking ways to contact with family (58%) followed by checking evacuation routes (51%), participating in disaster drills (51%) and preparing drinking water & emergency food and preparing portable radio or TV accounted for 50%. The least earthquake preparedness items checked by the respondents were searching information about earthquake done by only 4 people (2%), discussing with neighbor about how to prevent injury counting 14 people (8%) and preparing sleeping bag accounted for 16 people (10%). It is clear that preparedness items that relates with interaction with neighbors and structural measures scored lower in Kinugasa District. In addition, Figure 14 shows the number of respondents according to the number of checking. The respondents widespread from 0 to 21score with the mean score at 8 (the maximum score is 22).

As for WTP, table1 explains three activities. The respondents were asked their willingness to pay for supporting each activity: do not want to pay, I cannot pay 1,000 yen, I can pay 1,000 yen, and I can pay more than 1,000 yen. Figure 15 to 17 then indicate respondents' WTP for three activities. First, as to WTP for activity 1, 27 respondents did not want to pay, while 37 respondents answered that they cannot pay more than 1,000 yen but less than 1,000 yen. 68 respondents answered that they can pay 1,000 yen. 3 respondents chose the choice that they can pay more 1,000 yen. WTP for activity 2 was showed in Figure 16. 35 respondents did not want to pay. 37 respondents answered that they can pay less than 1,000 yen. 63 respondents can pay 1,000 yen for activity 2. Merely 3 respondents can pay more than 1,000 yen. Then, results of WTP for activity 3 is depicted in Figure 17. 23 respondents did not want to pay. 30 respondents cannot pay 1,000 yen but are willing to pay less than 1,000 yen, while 77 respondents can pay 1,000 yen and 5 respondents can pay more than 1,000 yen. In sum, it is found that activity 3 got the most support from the respondents, while activity 2 got the least.

From the analyses above, it can be mentioned that the respondents scored a variety of values of the variables. This is the evidence that two challenges evoked earlier were overcome by a variety of values.

Table 1. Explanation about three activities

	BENEFITS
Activity 1: Evacuation Information and Training	1. To disseminate information about evacuation in normal days through local broadcasting (TV) 2. To offer community to join in disaster drills held by Ritsumeikan University 3. In case of disaster or emergency, Ritsumeikan University to be an information center for lost and found contacts
Activity 2: Disaster Volunteerism Group	1. To prepare students volunteers who are well-trained in evacuation principles, to help you when you need to evacuate to safe places during disaster
Activity 3: Shelter – in – Place	1. To improve disaster resilient buildings in the campus of Ritsumeikan University 2. To make sure all accessibilities to Ritsumeikan University are well-prepared for disaster 3. To adapt universal design of refugee for all users (especially for disable people) 4. To ensure to stock enough basic needs for evacuees (food, water, medicine, blanket and so on) in the campus of Ritsumeikan University

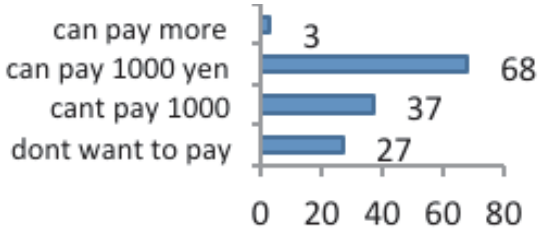


Figure 15. Willingness to pay for activity1

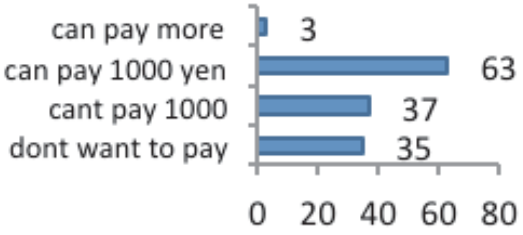


Figure 16. Willingness to pay for activity2

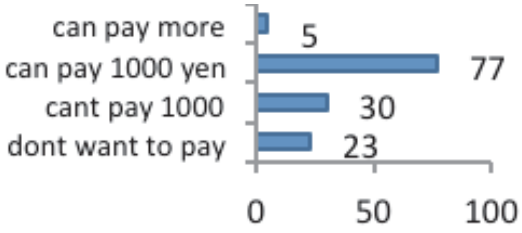


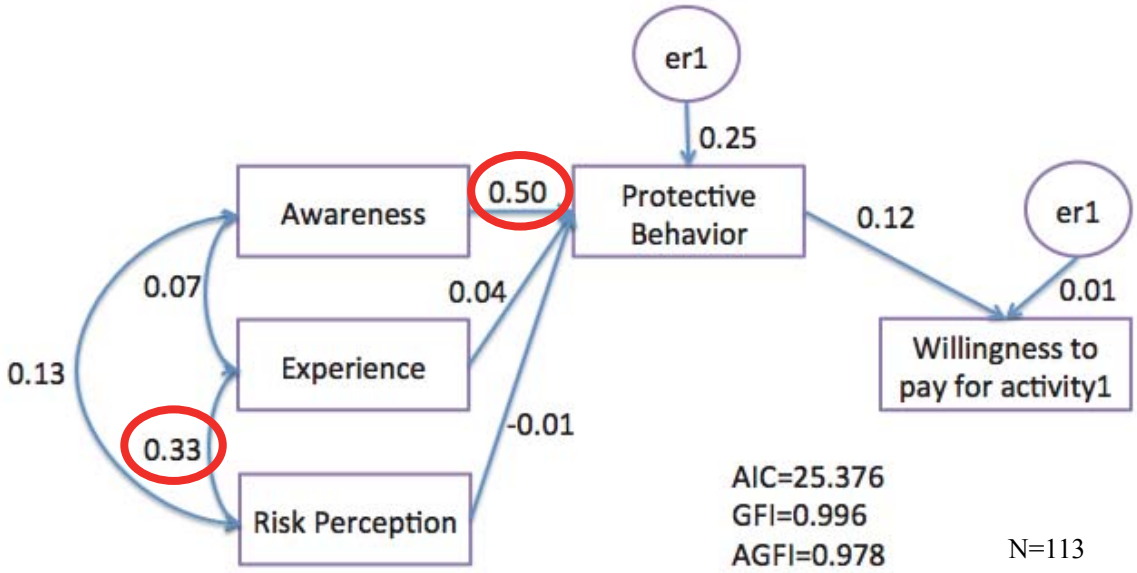
Figure 17. Willingness to pay for activity3

4.2 Factors Promoting Universities' Activities

The aim of this section is to verify the model of causal relations among residents' recognition and protective behavior and WTP for the activities, shown in the previous chapter. Figure 18, 19 and 20 illustrates pass models of WTP for activity 1, 2 and 3. From the figures, we can

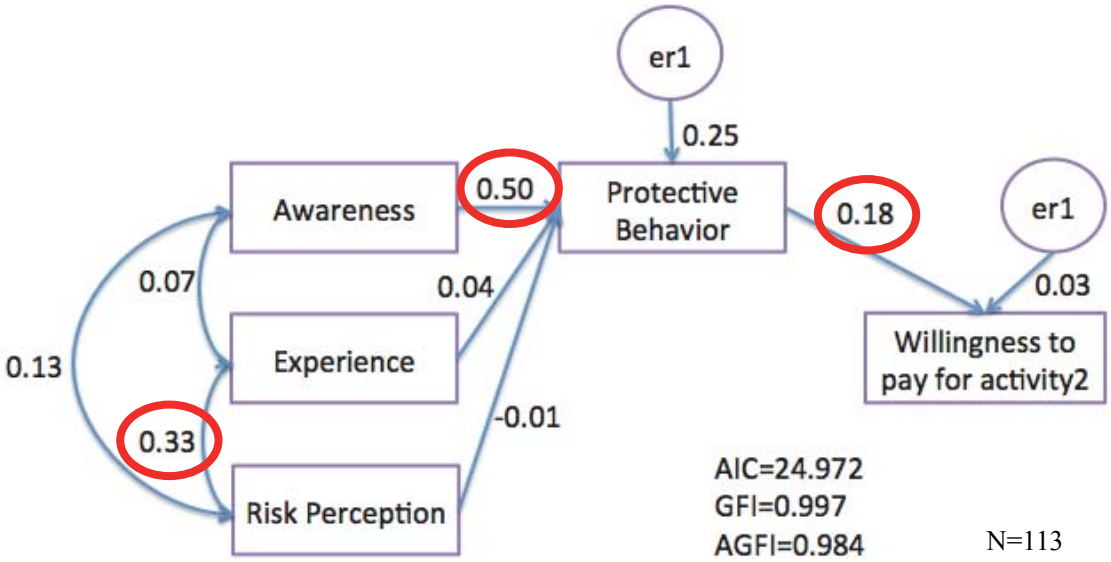
see significant correlation between risk perception and experience. However, these two recognitions do not promote protective behavior. On the other hand, awareness influence positively and significantly on protective behavior.

When we look at WTP for the activities, activity 1 and 3 did not influenced by protective behavior. However, it is found that in activity 2 the more protective behavior the respondents conduct, the more they tend to support the activity. And the activity 2 is the least supported activity as mentioned in the previous section.



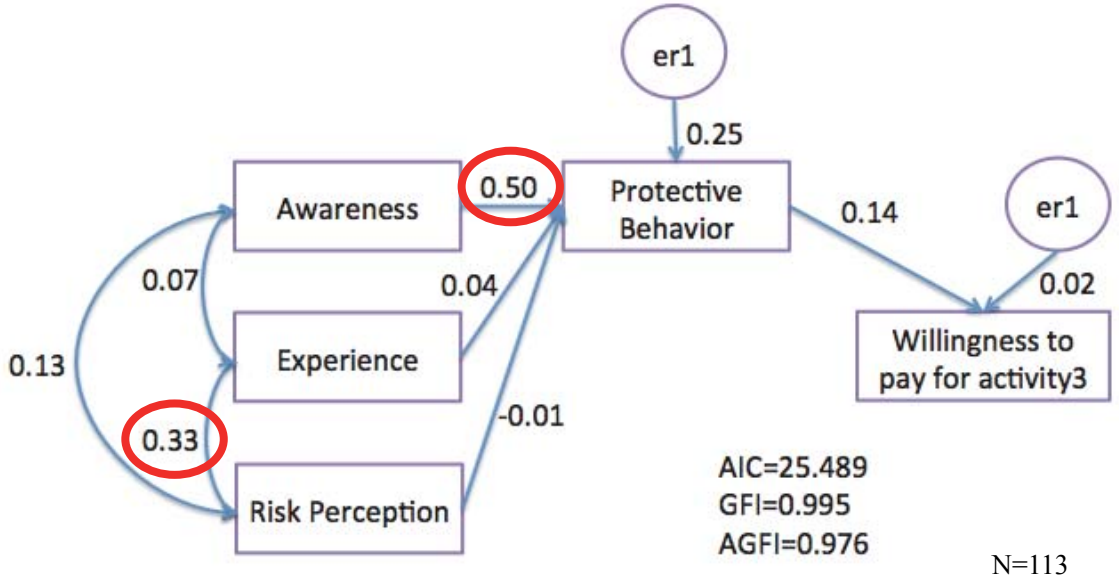
Note: Red circles mean significant relations between variables.

Figure 18. Path analysis on the willingness to pay for activity1



Note: Red circles mean significant relations between variables.

Figure 19. Path analysis on the willingness to pay for activity2



Note: Red circles mean significant relations between variables.

Figure 20. Path analysis on the willingness to pay for activity3

4.3 Hypothetical Relations between University Preparedness and Community Preparedness

The last two sections found that WTP for activity 2 was the least and the more protective behavior the residents have, the activity 2 tended to get support. However, other two activities have no relation with protective behavior. This section tries to suggest a hypothetical reason to explain this result.

When we consider residents' protective behavior, residents prepare for disaster to protect themselves could have much awareness of disaster and would tend to support all activities implemented by university. On the other hand, residents do not prepare much for disaster would tend to support activities that they prioritize and would not support other activities that they assume not-important. Although rough, following analyses support this hypothesis.

First of all, Figure 21 indicates that we can see no difference in protective behavior scores among the samples who prioritize different activities. The questionnaire asked the respondent to choose one activity that they prioritize the most. The result of Figure 21 is interpreted as that the degree of residents' protective behavior does not affect their priority on activities. Thus, the residents' protective behavior score and their activity preference are independent from each other. Based on this result, respondents were divided into three groups according to their prioritization to activities from 1 to 3.

Descriptives

Protective Behavior

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
activity1	36	8.56	3.047	.508	7.52	9.59	4	15
activity2	17	8.00	4.272	1.036	5.80	10.20	2	16
activity3	60	9.40	4.155	.536	8.33	10.47	1	21
Total	113	8.92	3.859	.363	8.20	9.64	1	21

Test of Homogeneity of Variances

Protective Behavior

Levene Statistic	df1	df2	Sig.
2.274	2	110	.108

ANOVA

Protective Behavior

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	32.994	2	16.497	1.110	.333
Within Groups	1635.289	110	14.866		
Total	1668.283	112			

Figure 21. Results of difference in mean scores of protective behavior among the groups

The Figure 22 shows correlations between respondents' protective behavior score and degree of WTP to each activity within the three groups. Among the samples prioritizing activity 1 or 2 the most, no relations was found between protective behavior and WTP to activities. On contrary, among the samples prioritizing activity 3 the most, if they have less protective behavior, they tend not to support activity 2. To be noted, this group shares more than a half of the entire sample. This indicates that more than half of residents tend to support activity 2 if they prepare well for disasters. As for activity 1 and 3, residents' support is not affected by their preparedness degree.

This implies one hypothesis as introduced above that for many residents it could be true that the more protective behavior residents take, they tend to support all three activities. However, the less protective behavior residents take; they tend not to support an activity which they do not prioritize. Thus, to get more support for activity 2 which got the least support among other activities, it is important to promote residents' awareness to the degree to which they take actions (preparedness) for disaster. Raising awareness itself is not enough. Although the research cannot show detail evidences to prove this hypothesis, it could imply the important relations between university preparedness and community-based protective behavior (preparedness) for further promoting University-Community Collaboration.

The sample prioritizing activity 1 the most

Correlations[a]

		Q15_financial_support_for_activity1	Q15_financial_support_for_activity2	Q15_financial_support_for_activity3
Protective Behavior	Pearson Correlation	.202	.203	.061
	Sig. (2-tailed)	.238	.234	.723
	N	36	36	36

a. Q15_Hight_priority_activity = activity1

The sample prioritizing activity 2 the most

Correlations[a]

		Q15_financial_support_for_activity1	Q15_financial_support_for_activity2	Q15_financial_support_for_activity3
Protective Behavior	Pearson Correlation	.000	-.094	.055
	Sig. (2-tailed)	1.000	.720	.833
	N	17	17	17

a. Q15_Hight_priority_activity = activity2

The sample prioritizing activity 3 the most

Correlations[a]

		Q15_financial_support_for_activity1	Q15_financial_support_for_activity2	Q15_financial_support_for_activity3
Protective Behavior	Pearson Correlation	.078	**.228**	.099
	Sig. (2-tailed)	.555	**.080**	.451
	N	60	**60**	60

a. Q15_Hight_priority_activity = activity3

Figure 22. Results of correlations between protective behavior and WTP for the activities in each group

5. Conclusion

This paper first explained important roles of university in response to mass disaster, especially the Great East Japan Earthquake. One lesson learnt from the earthquake was that universities took an important role as shelters for the victims and bases of disaster response, which required cooperation with other actors in normal days to fulfill the roles effectively. Among others, this study paid attention to collaboration of universities with community that needs support first as the first responder to disaster and the study proposed three activities that universities should

implement. After showing concepts of University – Community Collaboration, the study described residents' protective behaviors and factors influencing the behavior according to the previous studies. Then, we developed, based on University-Community Collaboration, a model of causal relations between awareness, experiences, risk perception, protective behavior and WTP for universities' activities. By setting our case study in Kinugasa District, we found that WTP for activity 2 was the least and the more protective behavior the residents have, they tend to support the activity 2. As a hypothetical reason, we suggested that the more protective behavior residents take; they tend to support all three activities. On contrary, the less protective behavior residents take; they tend not to support an activity which they do not prioritize.

As a conclusion, university protective behavior would be essentially connected with local communities' preparedness. To get university protective behaviors sustainably managed with support from residents, though in this paper evaluated only by the economic index, it would be important to promote community-based disaster risk reduction. Further study should tackle to find ways to promote University-Community Collaboration in details.

End Notes:

1) Community can mean a variety of groups, such as from communities in the unit of neighborhood association to ones in SNS (Social Networking Service). In this study, 'community' means group of residents categorized by geographical locations, such as the unit of neighborhood association.
2) As explained by Lansford, et al., "community resilience is a system that can be used to strengthen a community and ultimately a nation. Resilience distinctiveness accounts for the diverse recourse, values and structure which comprise an individual community. There are varieties of definitions for resilience. Some are based upon the notion that a resilient community is one that is simply able to bounce back or return to its state of normalcy when its functions and processes have been disrupted beyond its capacity to recover alone (Lansford T., Covarrubias J., Carriere B. and Miller J. 2010: 11)." Meanwhile, UNESCAP has given the definition of resilience in the context of natural disasters as "the ability of an individual, household, community or eco – system to withstand external shocks. Community resilience to natural disasters can be viewed in two dimensions, namely (1) the preparedness of a community in anticipating the coming of a natural disaster, and (2) the capacity of a community to regain normalcy in the aftermath of disaster (United Nations Economic and Social Commission for Asia and the Pacific 2008a: 7 – 8)."
3) The project of private – public sector collaboration to enhance community disaster resilience operated by National Research Council of the National Academies revealed that collaborative relationships often begin with local organizers who have identified specific community needs. The process continues by mobilizing key leaders and relevant stakeholders in the community. Ideally, collaboration includes representatives from local, state, and federal agencies; small and large businesses; nonprofit and faith-based organizations; academicians, researchers, and educational institutions; the mass media; civic and neighborhood organizations; technical experts; volunteers; and other diverse community stakeholders. Nevertheless, specific resources may not be available in some communities, and this confirms the importance of extending the reach of community beyond jurisdictional or geographic boundaries. When a community needs specific resources, collaborative networks may expand to incorporate regional stakeholders to fill the gaps. Disaster ignores jurisdictional and geographic boundaries, so communities will benefit by looking beyond such boundaries when building community disaster resilience (National Research Council of the National Academies 2012) .
4) We would like to thank Dr. Kazumasa Hanaoka (Assistant Professor of Tohoku University) and his colleagues for their briefings for part of the authors on IRIDeS during our field survey from 8th to 9th February, 2013, by which we could deeply understand the institute's work.
5) Though this book is not directly related to University – Community Collaboration for disaster risk reduction but it explained the collaboration to achieve a concept of smart growth. The goal is different whereas the process and how to encourage collaboration is more or less similar. This book contains case studies of efforts to promote smart growth at universities. The case studies were selected from a large number of submissions in response to a request for proposals. They provide examples from all parts of the country and different types of institutions, and involve university faculty, students, and staff. Despite their dissimilarities, they can be grouped into four categories: those that are embedded in university curricula; those that involve the work of a research center; those that result from collaborations; and those that involve the universities as an integral member of the community. (Wiewel W. and Knaap G.J., 2005)

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