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Development and Application of a Sensemaking Approach to Community-based Disaster Risk Governance

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Abstract

This paper explores community-based flood disaster risk governance by applying a sensemaking approach. The conceptual sensemaking framework consists of individual experience, dialogue, and socialization components, which together comprise an interconnected system. This study presents a method for applying this framework by using a concerns table and a SWOT analysis to examine the concerns of residents living in a flood plain. A series of community-based workshops on flood risk reduction was conducted with residents of the flood-prone Muraida community in Shiga Prefecture, Japan. During the workshops, residents' concerns regarding flood risk surfaced. This study used an idiographic approach to examine the proceedings of the workshops. SWOT issue analysis was used to examine the strengths and weaknesses in the Muraida community's internal capacities, and examine the opportunities and threats in the external capacities (e.g., local government). Additionally, a SWOT strategy analysis was conducted to identify strategies for knowledge sharing and development of cooperative countermeasures that can be undertaken between the Muraida community and the local government. The results show that the concerns table can not only summarize the main concerns of all workshops, but also provide an understanding of alternative flood risk countermeasures that can be carried out.

Keywords: Community-based Disaster Management, Sensemaking, Flood Risk Governance, Muraida community, Japan

JEL Classification Code: D70, D74, D83, H75, O21.

1. Introduction

Community residents' concerns are very important to the process of disaster risk management decision making. Surfacing their concerns ensures that the process followed is a democratic, participatory one, and that the process will produce higher quality results that are applicable to the specific regional context (Renn, 1997; Renn, 2004). However, community members' concerns have not tended to be viewed as important in the course of many disaster risk management decision-making processes. As a result, disaster risk management plans are often determined through government-led unilateral decisions.

Dibb (2003) points out that this kind of unilateral approach demonstrates an ignorance of good decision-making practices. He defined risk governance as a comprehensive process involving checking, assessing, managing, and communicating. The Risk Governance Framework developed by the International Risk Governance Council consists of multiple elements, including pre-assessment, risk appraisal, risk characterization and evaluation, risk management and comprehensive communication, and consideration of societal contexts (IRGC, 2005; Renn, 2009). This study defines risk governance as the process of solving problems and achieving goals through the participation and cooperation of stakeholders, including governments and residents. Despite the importance of risk governance, there are few relevant case studies that apply a specific methodology for the development of community-based risk governance.

The purpose of this study is to propose a specific methodology for flood risk governance, and to examine community residents' concerns about flood risk reduction, by applying the sensemaking theory of social constructionists. The stakeholders in flood risk governance have diverse knowledge, interests, resources, and authority. This study presents a flood risk governance process that uses a concerns table and SWOT analysis to support a sensemaking approach to stakeholder participation. In

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addition, the study aims to develop a method of fostering cooperation among stakeholders who have different and diverse concerns. The intent of this method is to facilitate more effective communication by surfacing stakeholders' concerns, understanding their differences, and developing flood risk action plans accordingly (Samaddar, Choi, Misra, & Tatano, 2014; Samaddar, Okada, Choi, & Tatano, 2017; Choi & Choi, 2018a; Choi & Choi, 2018b; Yamori, 2009). This case study analyzes the Muraida community in Maibara City, a flood-prone area in Shiga Prefecture, Japan.

2. Research Method and Materials

This study uses the case of the Muraida community to present a community-based flood risk governance process for the development of participatory disaster risk reduction plans. Communication is essential for effective flood risk governance. Pearce (1994) points out that there are two types of communication models. The first is the transmission model, which emphasizes the one-way sending of messages and information. The second is the social constructionist model, which states that social realities are determined through stakeholder interaction.

Social constructionists maintain that reality is constructed socially by communication: that is, through dialogue. Social constructionists emphasize that knowledge is not an individual process but a social one, and that human understanding of reality is formed by social interaction within communities. We view this formation process as socialization. According to social constructionists, knowledge and truth are not absolutes; rather, they are created through social interaction in communities (Gergen, 1994). Socialization in sensemaking, including opinions, intuition, questions etc., forms an interpretive lens through which situations are judged. People assign meaning to situations by sharing dialogues that they have experienced. Weick emphasized that people understand differences among people and predict situations through a sensemaking process (Weick, 2001; Weick, 2005). Social constructionists describe dialogue as occurring when people use language to describe a situation, and share this communication with others in a community. The resulting dialogue then forms a language convention about the situation (Gergen, 1994; Dervin, 1999). Weick (2001), who is a typical social constructionist, emphasized that the members of an organization form a common level of understanding about the organization, and this common understanding facilitates the successful achievement of organizational change.

The individual experiences of community members are an important source of dialogue. Individuals who have both direct and indirect experience with a situation are better able to express it and describe it more richly. Sensemaking imparts important meaning to people about individuals' experiences.

Along these same lines, residents have their own direct and indirect individual experiences regarding disaster risk in their communities. During community workshops, residents, experts, and local government officers are able to share their concerns, opinions, knowledge and wisdom about community vulnerability and about countermeasures that can be taken against disasters.. This kind of process develops a cohesive community among residents and enables them to make effective community disaster management plans.

<Figure 1> illustrates the three components of sensemaking and their interactions.

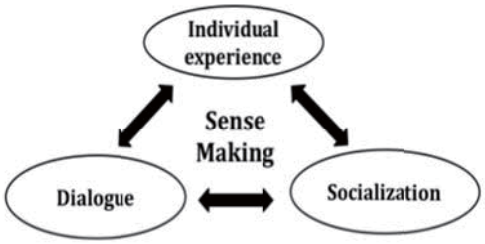


Figure 1: Conceptual framework of sensemaking

This study proposes that the concerns table be used as a means of providing a visual representation of community residents' concerns and the related reasons for these concerns. As can be seen in <Table 1>, the concerns table consists of a matrix in which the vertical column contains the social impacts of the risk (Vanclay, 2002), and the horizontal row contains the risk components: that is, hazard, exposure and vulnerability (Wisner, Blaikie, Cannon, & Davis, 2004). The table makes it possible to gather and to assess community concerns systematically. In the context of risk governance, the table provides guidance for the conceptualization and framing of the consequences of disaster risk in a community (Choi & Choi, 2018a).

Table 1: Concerns table

		Risk Factors		
		Hazard	Exposure	Vulnerability
Social Impacts	Health and social well-being			
	Quality of the living environment (livability)			
	Economic impacts and material well-being			
	Cultural impact			
	Family and community			
	Institutional, legal, political, and equity impacts			
	Gender relations			

Source: Choi and Choi (2018a).

Source: Google Earth(2019).

Figure 1: Map of Muraida

A SWOT analysis is often used to conduct strategic planning for organizational projects (Rauch, 2007; Hill & Westbrook, 1997; Weihrich, 1982). This study uses a SWOT analysis for scoping as a tool to understand socialization. Choi and Choi (2018a) described a method of using the SWOT analysis for scoping. In examining the case of the Muraida community, this study used both the SWOT issue analysis and the SWOT strategy analysis. The SWOT issue analysis was used to identify the strengths, weaknesses, opportunities, and threats relative to the concerns of Muraida's residents. Under the categories of strengths and weaknesses, this study examined the factors concerning flood risks that are internal to the Muraida community. Under the categories of opportunities and threats, this study examined flood risk reduction factors that are external to the Muraida community, such as the governments of Maibara City and Shiga Prefecture.

3. Case Study of the Muraida Community: Individual Experience

3.1. Pre-meeting to Understand Individuals' Experiences

Muraida is a community in Maibara City, Japan. With a total population of close to 385 people, Muraida is divided into two parts, the Kami area and the Simo area. The Ane

River, one of the largest rivers in Japan, runs along the northern side of Muraida. The De River in Muraida is used as an irrigation channel, and is very active during the heavy rainy season. At that time, the water level of the De River may start to overflow and inundate the surrounding areas. A satellite map of Muraida is provided below.

A pre-meeting was held to listen to the accounts of 10 residents who had experienced flood damage in Muraida. Because of typhoons, Muraida residents experienced major flood damage in August and September 1959. In August 1959, the Simo area was inundated by Typhoon No. 7. The Simo area is flood prone, as it is located 6 meters lower than the Kami area. In September 1959, a riverbank bordering Yoko Mountain and the Ichimichi Bridge was destroyed by Typhoon Isewan. <Figure 2> shows a map of the residents' individual experiences with flood risk.

3.2. Workshops to Understand Individuals' Experiences

Ten workshops that focused on flood risk management were held in the Muraida community from December 2010 through March 2013. They were attended by 10 members of the resident associations and relevant officials from Maibara City and the Shiga Prefecture government. The final workshop in the series had the primary purpose of summarizing the results of all of the previous workshops.

The main contents of the workshops are outlined in <Table 2>. On December 10, 2010, flood prone areas were confirmed by simulation. Field surveys to identify flood prone areas were conducted on March 3, 2011. On July 26, 2011, a decision was made to use the Disaster Imagination Game (DIG) with community residents in order to confirm and share information about evacuation places and routes. On October 7, 2011 alternative evacuation facilities and routes were discussed. On November 27, 2011, the DIG was conducted with 49 community residents. On December 20, the attendees reflected on the DIG results and their implications for evacuation plans and flood risk reduction. On February 3, 2012 the leader of the resident associations presented a community-based hazard map. On September 21, 2012 it was decided to organize a report meeting in order to share the flood risk reduction plan with residents. On November 23, 2012, the report meeting was held, informing the community residents of the workshop results and providing a forum for them to share their concerns. On March 7, 2013, the last workshop was held, focusing on a summary of all the previous workshops.

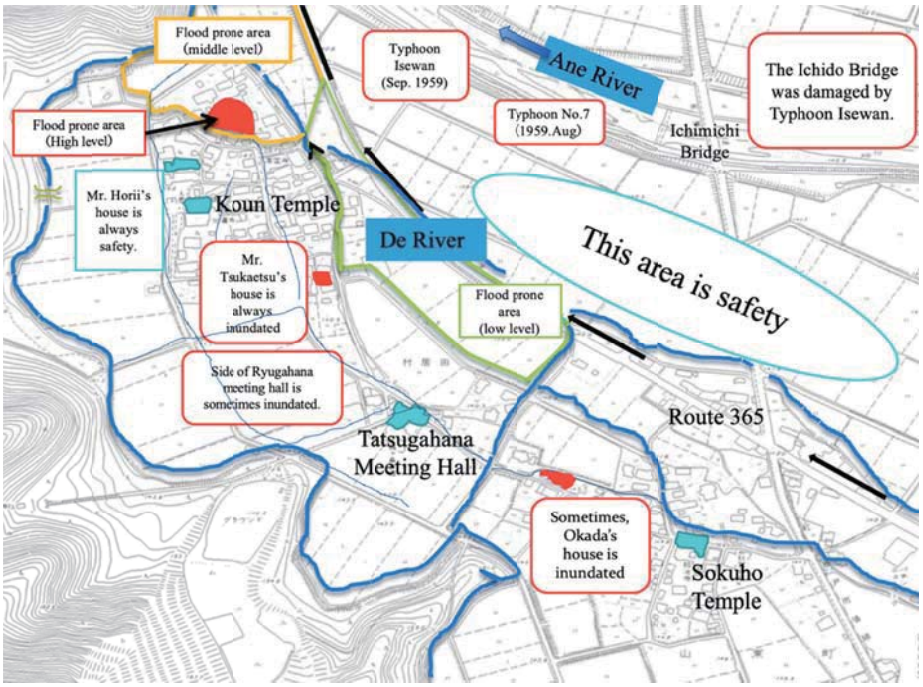


Figure 2: Mapping individual experiences of flood risk expressed by elder residents at the pre-meeting

Table 2: Workshop schedule

Year	Date	Main Contents of workshop
2010	December 10	Flood prone areas confirmed by simulation.
2011	March 3	Field survey conducted for simulation to check flood prone areas in community.
	July 26	1. Identified evacuation areas and routes by simulation. 2. Decision made to hold the Disaster Imagination Game (DIG) with community residents.
	October 7	Identified alternative evacuation facilities and routes.
	November 27	Held DIG with community residents.
	December 20	1. Discussed rules for evacuation. 2. Reflected on implications of the results of the DIG in regard to flood risk reduction.
2012	February 3	1. Presentation made by a community resident of a community-based hazard map. 2. Concerns for the future were shared.
	September 21	Discusssed having a “report meeting” in order to informing residents of the flood risk reduction plan.
	November 23	Informed community residents of the workshop results and shared concerns.
2013	March 7	Summarization of all workshops.

4. Concern Assessment by Applying the Concern Table as a Tool to Understand Dialogue

This section explores the socialization of sensemaking in regard to concern assessment. By using the concerns table, the residents’ concerns are identified and investigated. The residents’ concerns that were raised in each of the workshops are also described and explained in detail from the perspective of their social impacts.

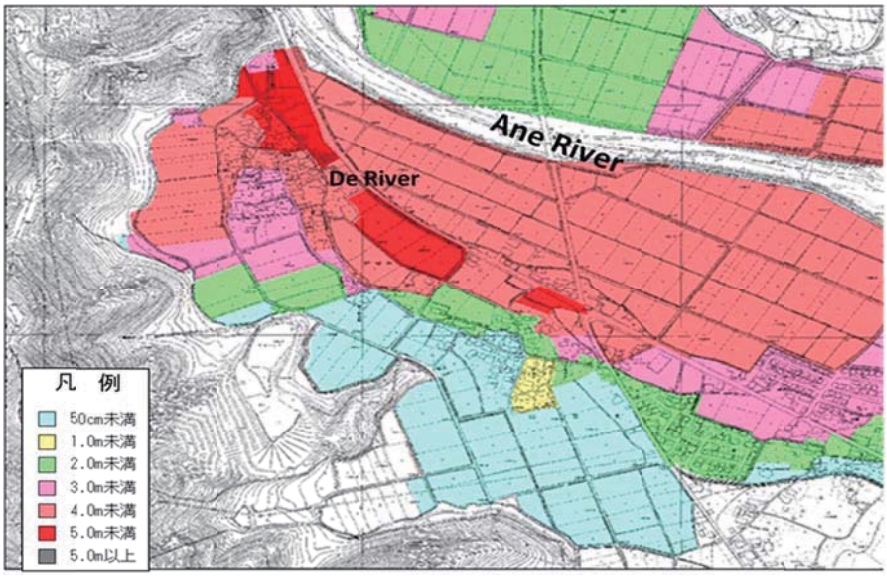
4.1. Decision on Flood Prone Areas: The First Workshop on December 10, 2010

A local government member provided an inundation map and a land height map made by the Flood Control Office of Shiga Prefecture <Figures 3, 4>. In the first workshop, a simulation method was used to identify flood prone areas, areas that are vulnerable to inundation. In the course of this first workshop, it was discussed that both the De and Ane Rivers are prone to flooding during the rainy season. The Ane River is a “Class A river” that flows from north of Muraida to Lake Biwa. When the river is at the flood stage, it tends to inflict significant flood damage. As a result, it is natural that Muraida residents were quite concerned about the water level of the Ane River. Members of the resident associations asked for an easy-to-understand tool that would clearly show the evacuation locations and routes. This concern led to the development of the “Marugoto Machigoto” hazard map. Before starting the workshop, local government members should communicate the following message.

During the meeting the community residents specifically stated that they could not trust the local government for flood risk reduction. The most likely reason for this is a lack of communication between community residents and local government. Also, to achieve flood risk reduction, it is necessary to take both structural and non-structural measures. Nonetheless, “River improvement is now in progress. However, it takes 20-30 years to complete. It should be noted that river floods break out at any time while the river improvement project is in process. Hence, residents would need ‘non-structural measures.’ The local government can help in this respect. What are the residents’ concerns?”

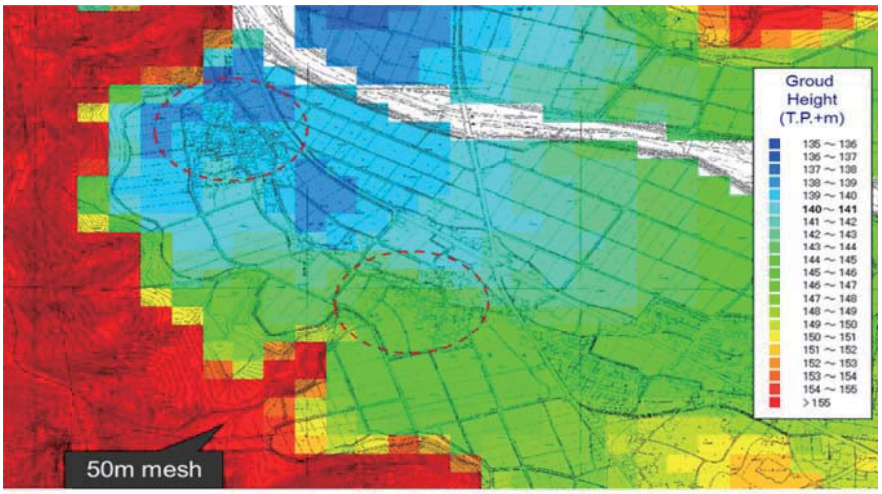
4.2. Field Survey: The 2nd Workshop on March 3, 2011

After using a simulation to designate the flood prone areas, the Muraida workshop members conducted a field survey to review the topography of Muraida. In particular, the validity of the designated flood prone areas and the suitability of the evacuation site were closely reviewed and examined. The ground height measure was also carefully reviewed to confirm the low ground areas with engineers. It is important to emphasize that the De and Ane Rivers can flood during the rainy season. It was also found that the grounds of Garyu Park are not suitable as an evacuation site. During the meeting it was noted that the citizens of Kami did not think that they were at risk. Residents were deeply concerned when they learned about the four-meter high “inundation hazardous districts” that had been identified in the Kami area. Their concern springs from the fact that many Kami residents believe their area is not prone to floods because the Kami area is higher than the Simo area. It will therefore be necessary to inform them that the Kami area also may not be safe from floods.



Source: Flood Management Office in Shiga Prefecture.

Figure 3: 100 year inundation frequency map



Source: Flood Management Office in Shiga Prefecture.

Figure 4: Ground height map

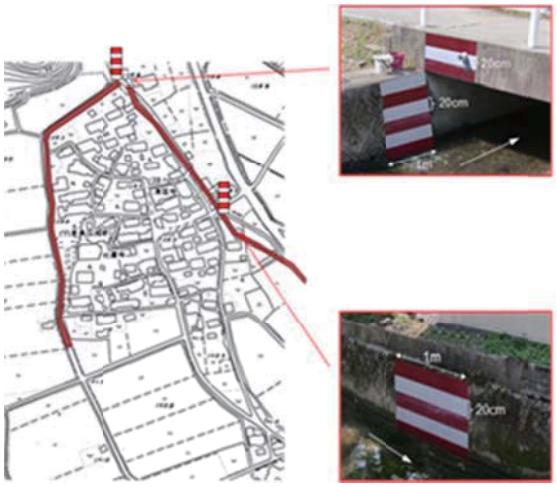
4.3. The Workshop Concerns on July 26, 2011

Since Typhoon Isewan broke out in 1959, there have been a few typhoons that have struck Muraida. Typhoon No. 6 struck right immediately before this workshop took place. This being the case, the members of the resident associations decided to discuss the concerns caused by this typhoon.

Typhoon No. 6 caused high water levels in the Ane River, but no flooding. The high water levels were the result of trees that had fallen into the Ane River. The water level of the De River that runs along the irrigation ditches was almost 15 cm high. If there had been more rainfall, the Muraida community might have been in danger. The Tatsugahana Meeting Hall, a site that previously had been selected as a formal evacuation center, was determined to be too small to accommodate all of the residents of Muraida. The members of the resident associations wanted to discuss alternative evacuation center sites and provide flood risk information to the community. As a result, it was decided to conduct a DIG session with community residents and facilitators.

4.4. The Workshop Concerns on October 7, 2011

During the course of this meeting, locations for flood water level gauges on the De River were decided. One location was determined by the local government and the other location was determined by the members of the resident associations <See Figure 5>. It is worth noting that the members of the resident associations proposed water gauge locations that were easy to see. The members of the resident associations wanted an evacuation rule for persons needing aid in disasters and discussed making a flood risk management plan for "persons in need of aid in the event of a disaster," including community welfare council members.



Source: Flood Management Office in Shiga Prefecture.

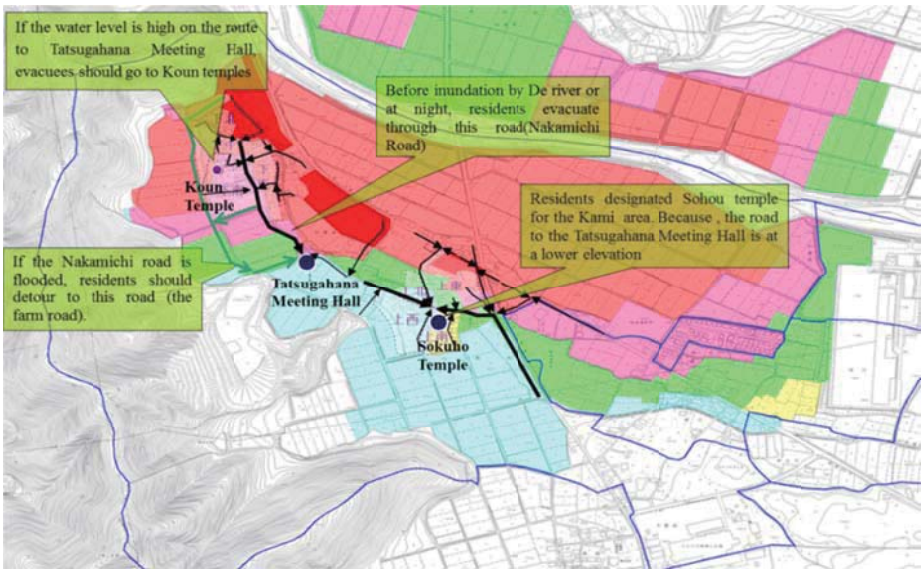
Figure 5: The water gauges on the De River

4.5. The Workshop Concerns on November 27, 2011 (DIG)

The DIG was conducted with 49 community residents. With each resident representing a household, their participation was equivalent to approximately 44% of the households in Muraida. The DIG is a method used to help residents share more of their concerns about flood risk reduction. First, the participants mapped out and identified the risks in their community area. When the mapping process was finished the facilitator introduced a flood risk situation and instructed the participants to think of actions that could be effective in reducing flood risk. Finally, the results of the discussions were presented to all the participants. This workshop included the discussion of an evacuation center and route, and the resulting information was shared with the participants. The residents' DIG map is provided in <Figure 6>.

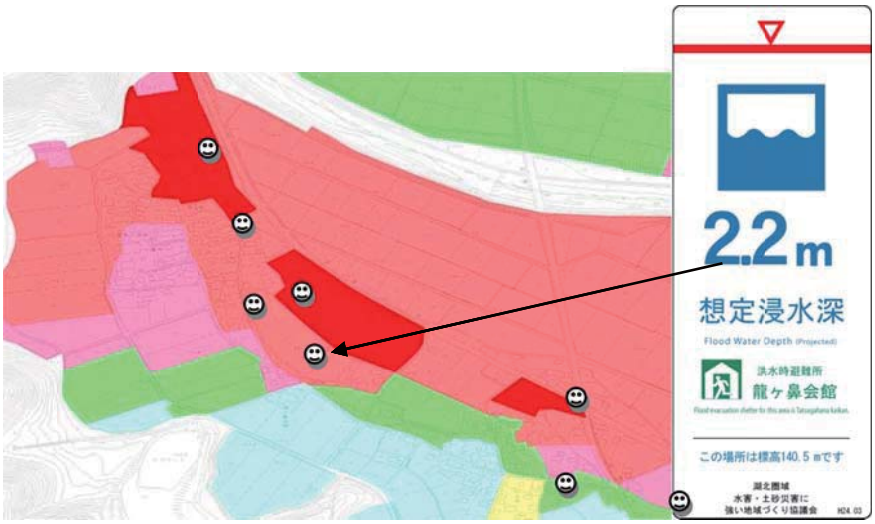
4.6. The Workshop Concerns on Dec. 20, 2011

The members of the resident associations decided to post eight Marugoto Machigoto Hazard maps in the community. Although the maps were originally going to be posted in ten areas, two areas were removed from the hazard list after the flood simulation revealed that they were not at risk for inundation. See <Figure 7> for a sample copy of the Marugoto Machigoto Hazard map, and locations where the map was posted.



Source: Flood Management Office in Shiga Prefecture.

Figure 6: Evacuation Plan Reflecting the DIG Results



Source: Flood Management Office in Shiga Prefecture.

Figure 7: Eight Marugoto Machigoto Hazard Map Locations and Sample

An evacuation route and appropriate evacuation shelters were identified by the residents during the course of the DIG workshop. However, participants in the subsequent workshop realized that some of the originally designated evacuation routes would be impassable after a heavy rainfall. Given this, it is important for residents to consider their immediate situation and its constraints when evacuating from a flooded area.

4.7. The Workshop Concerns on Feb. 3, 2012 and September 21, 2012

The social welfare department of the city office had already registered vulnerable residents as "persons needing aid in disasters" in order to provide special care and support to them during emergencies. However, there are many individuals or households who may qualify for this category, but who had not yet been registered by the city office. As a result, they were not able to take advantage of the information and special support offered by the social welfare department. Because of these unregistered persons, the community faces many difficulties over the issue of "persons needing aid in disasters". Therefore, it was decided that the existing list of "persons needing aid in disasters" would be revised and updated by the local community with the involvement of the same group members. Once the list of members was revised, each person needing aid in disasters would have their house location marked on the community-based hazard map. Moreover, since assistance from the local government would take time to reach such victims during emergencies, local community resources would be tapped to assist them before other outside support becomes available.

There was a heavy rain (50 mm/hr) in Muraida on September 18, that is, before the workshop on September 21. Consequently, the members of the resident associations discussed concerns that arose because of this heavy rain. During the workshop the community-based hazard map was enhanced by incorporating the residents' opinions. Although most of the map remained unchanged, several new features were added. The pictures of nine risky areas were included. (Among the nine areas were two areas where residents actually died because of an inundation.) The "isolated lands" of Muraida were included. Residents' names and house locations were included. Information about flood risks and emergency goods were printed on the other side of the map.

This workshop was also used to create a plan for the "report meeting" for the community residents, an event that would allow the group the opportunity to share their progress on flood risk reduction. It was decided that the report meeting would be conducted on the annual "disaster drill day" in December. The places and methods of organizing the meeting would be the same as those used when the DIG was scheduled in 2011.

4.8. The Workshop Concerns on November 23, 2013

On November 23, 2013, the "report meeting" was held with Muraida community residents (48 residents in total) and with the workshop members. The agenda included a report on how the flood risks were addressed over the course of

the past two years, and an opportunity for sharing concerns about coping with flood risks by using the community-based hazard map. For a summary of the concerns table, see <Table 3>, below.

Table 3: Summary of concern table

Date	Social Impacts	Risk component & Main concerns
Dec. 10, 2010	**Living environment (Livability)**	**Hazards** ✓ The De River may have inundated during the rainy season than did the Ane River.
	Living environment (Livability)	**Exposure** ✓ The Kami area is identified as a flood prone area by simulation.
	Living environment (Livability)	**Vulnerability** ✓ Information on the ground height and inundation height on the street is needed to decide the appropriate evacuation facility and routes.
	Family and Community	**Vulnerability** ✓ A resident-to-resident information delivery system is needed for evacuation.
	Institutional, legal, political, and equity impacts	**Vulnerability** ✓ Community residents may have not trusted the local government because of a lack of communication with each other.
Mar. 3, 2011	**Living environment (Livability)**	**Hazards** ✓ The De River may have inundated more during the rainy season than did the Ane River.
	Living environment (Livability)	**Vulnerability** ✓ Information on the ground height and inundation height on the street are needed to determine the evacuation facility and routes. ✓ The grounds of Garyu Park are not suitable as a flood evacuation shelter because there is no facility on site. There are facilities for earthquake evacuees, however.
	Family and Community	**Vulnerability** ✓ Almost all Kami area residents think that their area is not at risk.
Jul. 26, 2011	**Living environment (Livability)**	**Hazards** ✓ Typhoon No. 6 had struck just one week before the workshops and people had recent experience with the flood risk in Muraida.
	Living environment (Livability)	**Exposure** ✓ The sluice gate of the De River is quite old and can be easily damaged. Trees may also fall in the river, thereby causing floods as water levels rise.
	Living environment (Livability)	**Vulnerability** ✓ The Tatsugahana Meeting Hall is more suitable as an evacuation shelter than the Garyu Park grounds (the previous evacuation site), because it has a facility that protects residents from wind and rain.
Oct. 7, 2011	**Living environment (Livability)**	**Hazards** ✓ Several years ago, one resident died at the agricultural irrigation canal due to flooding there. ✓ Many ditches running along the community road have the potential for inundation.
	Living environment (Livability)	**Vulnerability** ✓ The writing on the Marugoto Hazard Map should be enlarged to accommodate elderly residents.
	Family and community	**Vulnerability** ✓ Evacuation rules and processes need to be developed to accommodate persons with special needs.
Nov. 27, 2011	**Living environment (Livability)**	**Capacity** ✓ The Tatsugahana Meeting Hall is a suitable evacuation facility for flood risk but is not large enough to accommodate all residents . ✓ The Sohou temple for the Kami area and the Tatsugahana Meeting Hall for the Simo area are better for evacuation facilities. ✓ The Nakamichi Road is the main road for evacuation, but if the road is flooded, the farm road is an alternative.
	Family and community	**Capacity** ✓ Developing the evacuation rules based on DIG results.
Dec. 20, 2011	**Living environment (Livability)**	**Exposure** ✓ The sluice gate located at the mouth of De River has the potential for flood risk, but the Muraida community does not have the right and ownership to repair it.

	Living environment (Livability)	**Capacity** ✓ As a result of the DIG exercise, the Marugoto Machigoto Hazard map was posted on the community streets in eight flood prone areas. ✓ As a result of the DIG exercise, main and suitable alternate evacuation routes and shelters were finalized.
Feb. 3, 2012	**Living environment (Livability)**	**Capacity** ✓ At a general meeting, community residents were informed about the Marugoto Machigoto Hazard map and the use of the simple water gauge.
	Institutional, legal, political, and equity impacts	**Capacity** ✓ The social welfare department of the city office has information on persons needing aid in disasters. In order to provide care and support to them, the information is needed by the local community.
Mar. 7, 2013	**Living environment (Livability)**	**Hazard** ✓ The Ane and De Rivers appear risky when heavy rain falls.
Nov. 23, 2013	**Living environment (Livability)**	**Vulnerability** ✓ Syoren Temple and Kita Mountain are not suitable as evacuation facilities because they are vulnerable to landslides.
	Family and Community	**Capacity** ✓ Evacuation is not encouraged by car on community roads. Some residents want to use cars for evacuation but it cause traffic congestion.
	Institutional, legal, political, and equity impacts	**Capacity** ✓ Collaboration is needed urgently with community welfare commissioners for "persons needing aid in disasters" because community welfare commissioners check on them regularly, and understand their specific needs for assistance.

Table 4: SWOT issue analysis

Strengths	**Weaknesses**
✓ The members of the resident associations who have participated in the workshops are very active in expressing their opinions and want to make their community flood-resistant. ✓ Over time, the members of the resident associations begin to take initiatives on the flood risk management plan.	✓ The Muraida community is a flood prone area. The De River is often inundated, and the old sluice gate of De River is vulnerable to damage. The Kami area has potentially hazardous zones, and many agricultural irrigation ditches run beside community roads. ✓ Residents who did not participate in the workshops are not aware of their area's flood risk. ✓ There is no plan for persons needing aid in a disaster.
Opportunities	**Threats**
✓ The Maibara city and Shiga Prefecture governments have the political will to support flood risk reduction. This was seen in their rapid response to Muraida residents' concerns about flood risk through the development of the Marugoto Machigoto hazard map and by holding the DIG.	✓ After the workshop, residents and local government officials will not meet frequently. This will make it difficult to ensure the continuance of cooperation. ✓ The river improvement plan is not complete and is still ongoing.

5. Scoping by Applying the SWOT Analysis as a Tool for Understanding Socialization

5.1. SWOT Issue Analysis

Through the use of the concerns table, residents' concerns were summarized and shown to change dynamically as the workshops progressed. As mentioned in section 2, a SWOT issue analysis and a SWOT strategy analysis were carried out. The main concerns raised in the concerns table were placed in the SWOT issue analysis table as is seen in <Table 4>.

In the context of the SWOT analysis, "Strengths" include the passion of the members of the resident associations who participated in the process. These members were very active in expressing their opinions, and they wanted to help their communities become flood resistant. Over time, the members of the resident associations began to take more initiatives in the development of the flood risk management plan. "Weaknesses" are those factors that are tied to specific local characteristics. For example, the Muraida community often experiences flooding from the De River, and the old sluice gate of De River is vulnerable to damage. The Kami area has potentially hazardous zones, and many agricultural irrigation ditches run along community roads, providing an opportunity for flooding. Also, many Kami residents who did not participate in the workshops are not aware of their area's flood risk. Another weakness is that no

plan exists to assist persons needing special aid in a disaster. “Opportunities” include the local government will to reduce flood risk in the Muraida community. The Maibara city and Shiga Prefecture governments demonstrated their will by responding quickly to Muraida residents’ concerns about flood risk through the development of the Marugoto Machigoto hazard map and by holding the DIG workshop. “Threats” includes the fact that after the workshop, residents and local government officials would not meet frequently, making it difficult to ensure the continuance of cooperation. Another threat was that the river improvement plan was not complete and was still underway.

5.2. SWOT Strategy Analysis

In the SWOT issue analysis, the internal capacities of the Muraida community are the strengths and weaknesses, while the opportunities and threats are the external capacities of the community such as local government. Therefore, if we endeavor to combine the internal and external factors through the SWOT strategy analysis, the potential for cooperation, knowledge sharing and countermeasure implementation between the local community and government becomes readily apparent. For example, the Muraida community residents have traditional flood reduction knowledge, while local governments have technical knowledge. Neither the residents nor the governments have a deep understanding of the others’ knowledge. It is important that they share this knowledge with each other, not only to strengthen their flood risk reduction efforts but also to prevent their knowledge from being lost by not being shared.

This section outlined an approach for the development of new knowledge about flood risk countermeasures by using the SWOT Strategy Analysis as scoping tool. The details of the analysis are shown in <Table 5>.

The SO strategy is the result of the interaction of the internal and external strengths of the Muraida community and the Shiga Prefecture. Community residents should share flood risk information and sustainably enhance the community’s capacity against flood risks by cooperating with the local government. The ST strategy focuses on the internal strength of the Muraida community in the absence of assistance from Shiga Prefecture after the workshops are finished. (Shiga Prefecture officials would seldom visit the community after the completion of the workshops.) Recognizing this, community residents should often hold community events about flood risk reduction so as not to lose community interest about flood risk countermeasure sustainability. To put it concretely, the community leader and eight areas group leaders from the eight hazard areas in Muraida should regularly share flood risk information with all residents through community meetings that are held in a month that is specifically designated for focusing on flood risk management. In the Muraida community, events are regularly conducted in the same month each year, such as the spring cleaning event in March, the sports event in May, and the disaster drill in November. Similarly, a special month should be set aside for the community to discuss ways of strengthening their flood risk resistance. The WO strategy shows how the internal weaknesses of the Muraida community can be overcome with assistance from the Shiga Prefecture government. Many flood risk countermeasures will be conduct with the assistance of local government, such as setting a water level signboard to check the water level of the Ane River, and posting Marugoto Machigoto hazard maps at flood prone areas. The WT strategy is the result of the interaction of Muraida’s internal weaknesses and the lack of assistance from the Shiga Prefecture government after the workshops have ended. Specifically, after the workshops are over, community residents will document and check the location and situation of persons in Muraida who need aid in disasters. The problem of persons needing aid in disasters was often raised in the course of the workshops. In the final workshop, the problems were discussed in depth, but no conclusive resolution could be reached.

Table 5: The SWOT Strategy Analysis

	Opportunities	Threats
Strengths	SO strategy By cooperating with local government, community residents should share flood risk information and sustainably enhance the capacity against flood risks.	ST strategy Community residents often hold community events about flood risk reduction in order to maintain interest regarding flood risk countermeasure sustainability.
Weaknesses	WO strategy Many flood risk countermeasures will be conducted through local government assistance, such as installing a water level signboard to check the water level of Ane River, and posting Marugoto Machigoto Hazard Maps at flood prone areas.	WT strategy After finishing the workshops, community residents will document and check the location and situation of persons in Muraida needing aid in disasters.

Information about persons needing aid in disasters is available only to community welfare commissioners in Muraida. For this reason, community welfare commissioners should regularly participate in flood risk reduction community meetings in order to provide information regarding the location and specific requirements of persons needing special assistance in disasters.

6. Conclusion

6.1. Summary

This study applied the conceptual framework of sensemaking, consisting of individual experience, dialogue, and socialization, to the case of community-based disaster risk governance in Muraida. We chose Muraida in Japan as the case study area for this study because Muraida is a flood-prone area situated near the Ane River, which is one of the largest rivers in Japan, and De river is a trough in Muraida used as an irrigation channel. Ten workshops that focused on flood risk management were conducted from December 2010 through March 2013. A total of 10 members of the resident associations and relevant officials from Maibara City and the Shiga Prefecture government participated in these workshops. A series of workshops were held, enabling participants to share their individual experiences regarding flooding. Residents expressed varying concerns about the flood risk in Muraida at these workshops, while local officials also reported the residents' concerns regarding their resources and abilities. This study then utilized the concerns table as a concern assessment tool for dialogue and used SWOT analysis as a scoping tool for socialization. In this manner, this study has explored the dynamic changes that occur in community concerns in terms of concern assessment and scoping, based on sensemaking.

6.2. Implication

During the workshops, the members of the resident associations were encouraged to express their own concerns regarding flood risk in the Muraida community. Following this, they wanted to share the concerns with all community residents. The concerns table not only summarized the main concerns that were gathered in the course of all of the workshops but also facilitated the development of a higher quality of alternative flood risk countermeasures that could be considered and implemented. At the beginning of the workshop series, the members of the residents association and the local government representatives had different thoughts on flood risk management. As time passed, however, they both came to realize that cooperation with one another would serve as the best countermeasure against flood risk. The tools and processes proposed in this study can be applied to facilitate joint collaboration on a flood action plan, making it possible to establish a system of community-based flood risk governance.

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