Review of Hazard Information Collected for Local Disaster Prevention by Residents in a Historical Local Town

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Abstract: We are developing a hazard map creation support system for historical local towns. Our system aims at collecting specific information received from residents and raising resident's consciousness to disasters by recording hazardous locations where residents feel danger in case of disasters. In this paper, we examine the hazard information of the area collected by the residents themselves in using the system. While exchanging opinions, the residents review the validity and completeness of the information gathered by walking around the area. We also consider how to integrate and share it throughout the region.

Keywords: regional disaster prevention, voluntary disaster prevention, hazard information, historical local town, local residents,

1. Introduction

Japan, which is a disaster-prone country, faces the threat of various natural disasters, such as earthquakes, typhoons, and volcanic eruptions (Disaster Management, Cabinet Office, 2015). A variety of disaster prevention measures and trainings have been studying (Geospatial Information Authority of Japan (GSI),2017; Mitsuhara, H. et al., 2015; Nakai, F. et al., 2014; Nonomura, A. et al., 2016; Sakuma, A. et.al., 2015).

Our approach in this paper is small-start ICT-based disaster prevention, which is rooted in the region and based on the characteristics of a historical local town (Okazaki, Y., et al., 2016). We have been developing a hazard map creation support system for a historical local town with old Japanese scenery (Kozaki, S. et al., 2017; Okazaki, Y., et al., 2017). These towns are vulnerable to disaster because of depopulation, aging and preservation of the traditional landscape (Japan Guide.com, 2012). In these historical local towns, it is necessary to grasp the characteristic dangers, which are difficult to grasp from the general viewpoints, from various perspectives of local residents.

We selected Hizen-Hamashuku in Kashima City of Saga Prefecture in Japan as a model areas of historical local towns. This region has remained old city from the Edo era and has been designated as nationally important traditional buildings preservation districts (Agency for Cultural Affairs, 2017; Saga Trip Genius, 2014).

Our system supports to make regional hazard map in the following procedure: (1) Residents walk around the area and find dangerous location. (2) He/she posts the information on a tablet device (a position, a photo, a disaster type, a risk level and comments). (3) The posted information is stored in the database of the server. (4) Each terminal acquires information from the database on the server. (5) The terminal can show all posted information. The continuous resident participation and posting design are core concept for our community-based approach.

We expect that local residents can collect detailed information including particular to the historical local town and also expect that disaster prevention awareness of residents can be improved by participation activities. Utilizing this system, we have collected the hazard information of each district by local residents themselves walking around the districts by themselves (Okazaki, Y., et al., 2017).

In this paper, we conduct mutual evaluation of the collected information through exchange of opinions by local residents. The viewpoint of evaluation is as follows: Our system is able to support (1) collecting hazard information of residents' perspective, (2) collecting exhaustive information, and (3) the validity of posted information. This study shows that our approach is useful for collecting and sharing danger information including particular to historical local towns based on the residents' perspective, and discuss their achivement and future issues.

2. Collection of Hazard Information by Town Walking

On September 29, 2017, 11 local residents and 8 our members took a walk using our system and gathered information. About 15 minutes, we explained the way of using the system to the residents. After that, we assigned persons in charge of the six districts in the target area. They are "Shokin", "Minamifunatsu", "Kitafunatsu", "Nakamachi", "Hashuku" and "Shinmachi". The person in charge of each district is a group of 2 to 4 people including the local residents of the district and our student members. Each group searched for each district and registered district hazard information. The time to walk around town was around 1 hour including the round trip to the starting point.

Figure 1 shows the hazard map created in this activity. A total of 50 regional hazard information was registered. We asked local residents to input information. Most of the information was input by the residents themselves, but our members (students) entered information on the support of uneasy people and the information they found themselves.

Figure 2 shows information registered in each district. The type and number of registered information are different for each district. Moreover, these differences reflect the anxiety of each district against these disasters including the town specific. We believe that we could create a hazard map reflecting the characteristics of the district by walking around and registering information in using our system.
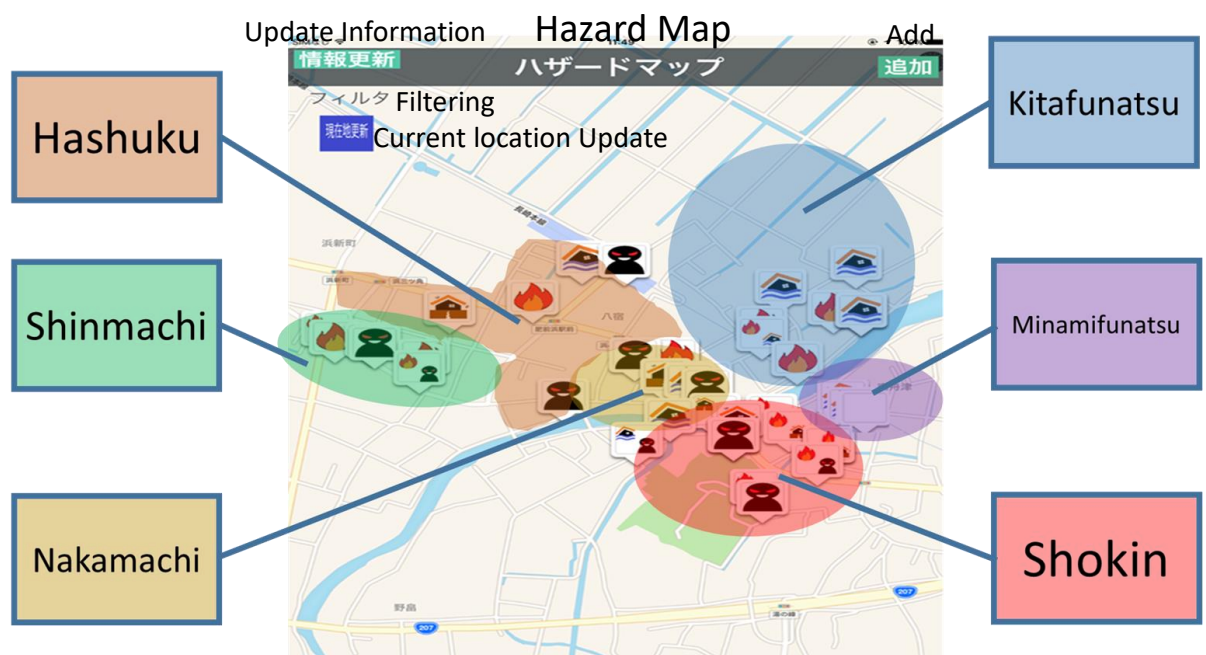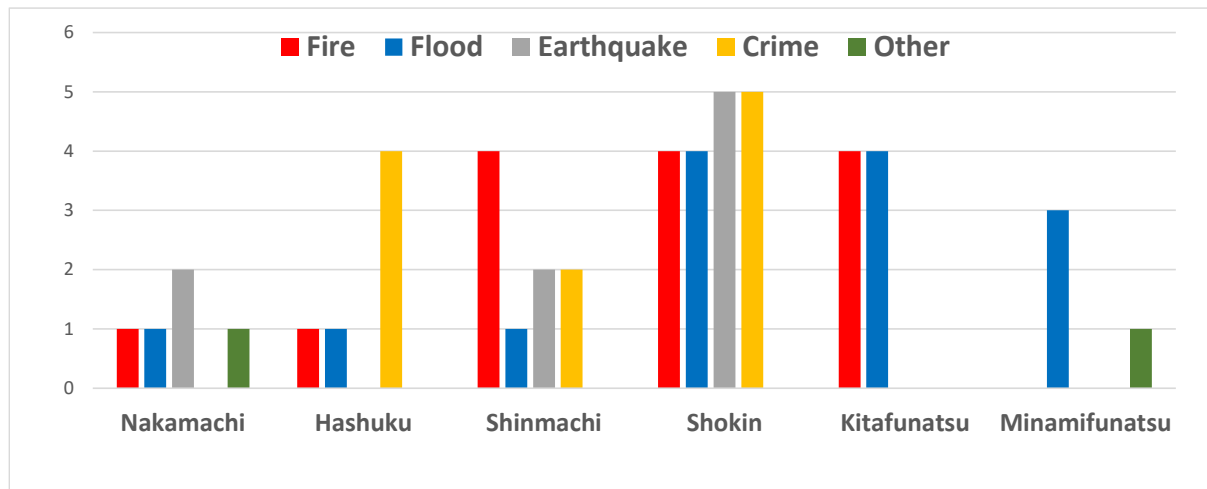

Figure 1. The created hazard map

Figure 2. Hazard information registered in each district

3. Posted Hazard Information Review Meeting

3.1 Outline of the Review

The review meeting was held at Hama public hall, which is a community hall in target area, on April 19, 2018. There were 9 participants, who are 5 local residents, one Kashima city official staff and 3 our members (one professor and two graduate students). The residents are representative for voluntary disaster prevention activities from each district in the target area. The city official belongs to the City Construction Division which administer the target area. We held the meeting for about 2 hours from 10 AM.

3.2 The Meeting Process

We prepared a large-scale ZENRIN map of 1/250 scale. It shows the target area by A0 size paper. The reasons why we applied not tablet devices but a paper map are (1) it is suitable for exchanging opinions while sharing information, (2) it is easy to operate on information such as pasting or writing on a map, and (3) it is easy to grasp activities of other participants.

We examined 23 regional hazard information, which is judged risk levels 3 (the most dangerous) or level 2 out of 50 pieces of hazard information collected by walking around the target area. The area is divided into 6 districts as we described above. They are "Shokin", "Minamifunatsu", "Kitafunatsu", "Nakamachi", "Hashuku" and "Shinmachi". We have given ID number for identification to all information beforehand. We printed 23 sheets of hazard information and distributed them to participants. Each sheet expresses hazard information at each point (Figure3).

By attaching a numeral seal to the position on the map corresponding to each information ID number, we prepared the location confirmation. All the participants checked each position, a photo, and hazard information in turn, and exchanged opinions.

We also carried out questionnaires on the completeness and validity of posted information.

ID District Risk level Serial number for each risk level in each district

⑪ 中町 3—1

Risk level 3
危険度：3

火災 Fire

水害 Flood

地震 Earthquake
建物が老朽化。
The house is aging

犯罪 Crime

Figure 3. An example of distributed hazard information sheet

3.3 Results and Discussion

At the review meeting, we confirmed that we were able to collect 12 danger information specific to a historical local town among 23 targeted danger information of risk level 2 and 3. They are 7 dangers caused by structure particular to historical local towns, 4 dangers with respect to the aged structures and 1 dangers related to the elderly.

Figure 4 shows the results of answers to the question of whether they knew the each hazard information from before. We can see that about 80% of hazard information knew from before. This result shows that the residents were able to gather hazard information of the district from the residents' perspective by using our system. The 20% hazard information recognized for the first time at this review meeting was information on districts other than their own district. In the existing method with ad hoc message exchange, sharing of hazard information of beyond the district is insufficient. This shows the usefulness of information sharing by our system.
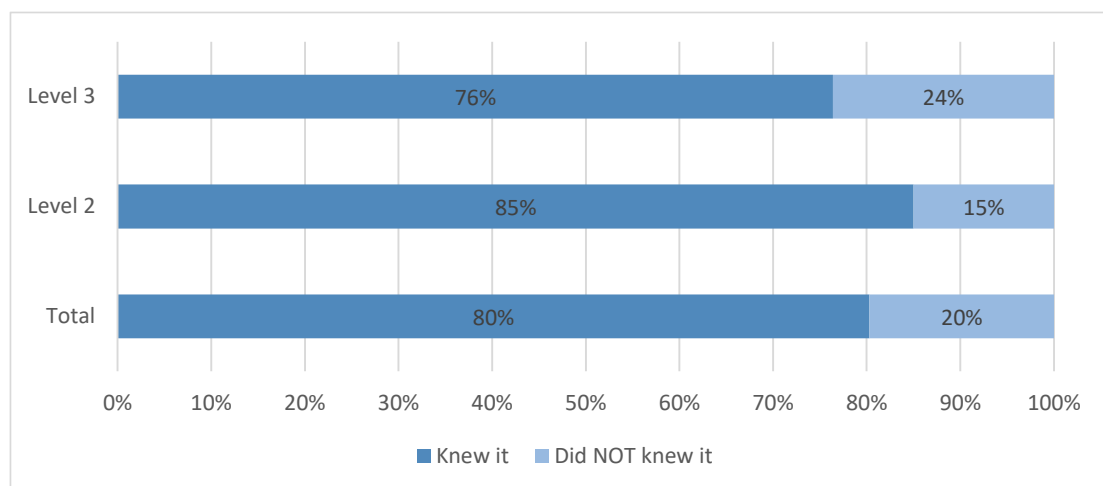

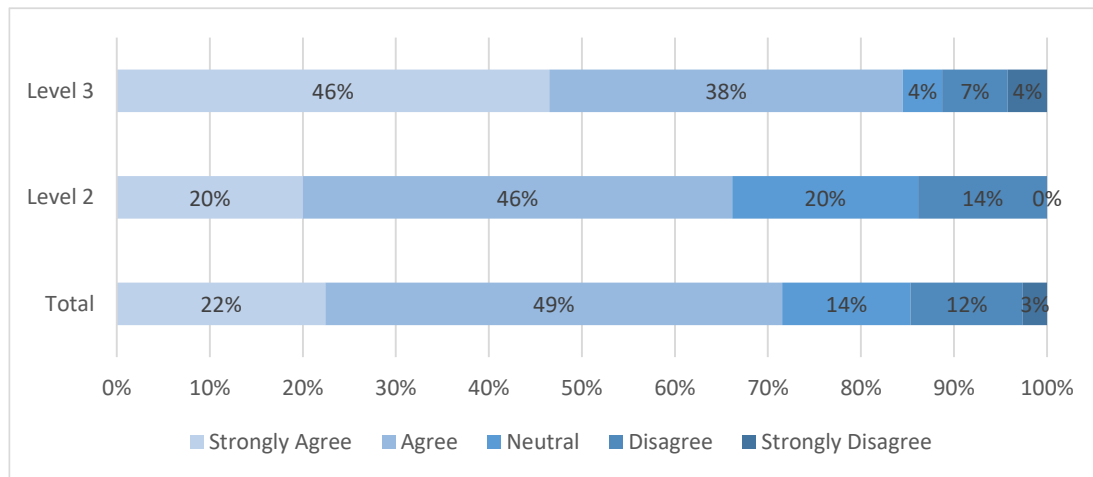*Figure 4.* Answers to the questionnaire (Did you know the danger of the place from before?)

Figure 5. Review of risk level based on subjective evaluation

It is also supported from the residents own words "We don't know the detailed information of other districts. It is very useful to share the hazard information gathered for each district together in considering district disaster prevention".

After the review, we asked the participants if they walked around again, they could find new hazard information. Their answer was negative. We consider that the collected hazard information has covered almost everything because voluntary disaster prevention members in each district actually walked around his/her district and entered the information.

Figure 5 shows the results of answers to the question of whether the information the residents judged risk level 3 and level 2 (Level 3 is the most dangerous) is really dangerous. There is no clear criteria of the risk level to be given at the time of posting information. It is left to the subjectivity of the poster. About 84 % of the information judged as risk level 3 is recognized as dangerous. About 66 % of risk level 2 is the same. Approximately, 15% and 33% of the information judged level 3 and level 2, respectively, revealed that the danger could not be recognized. This result shows that it is possible to gather information from various viewpoints due to subjective evaluation of residents.

We believe that differences in opinion encourage discussion and analyzing their opinions will contribute to increase reliability. It is meaningful to collect and share information on places where some residents feel dangerous in their daily life. Among the places where some residents thought it was dangerous, it was found that countermeasures were already taken and the danger was reduced. It was also revealed that disasters have occurred in the past even though they do not appear to be high in danger, and that this is not well known. Through this review meeting, it was beneficial that these cases above were become apparent and shared among residents. These findings indicate that it is desirable to create a mechanism to provide hazard information with some degree of reliability in sharing it among all residents. In order to realize this, it is necessary to review the causes of each hazard information from multiple perspectives.

4. Conclusion and Future Works

In this paper, we examined the regional hazard information collected by the residents themselves in using our hazard map creation support system. The target area is historical local town in Saga, Japan, where the old good streets of the Edo period remain. While exchanging views surrounding the large-scale paper map of the area, the residents review the validity and completeness of the information gathered by walking around the area. We found that it was possible to gather regional hazard information including specific to historical local town from the viewpoint of residents in addition to high coverage for each district. Also, by sharing information at the review meeting, the residents were able to newly know the hazard information of other districts that they did not know before. This shows the usefulness of residents to share the dangerous information while examining each cause across the different districts. Subjective assessment of risk level makes it possible to

gather information from various perspectives. Such information with different evaluations will trigger detailed review and encourage discussion. This leads to a deeper understanding of the dangers of the place and an increase in the reliability of the information.

In future research, we will make a mechanism to improve collected hazard information through exchange of opinions among local residents and create a reliable regional hazard map for the area. We hope that our research contributes to preparing for disasters by communicating the collected hazard information to all residents in an easy-to-understand manner.

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