A STUDY OF FLOOD EVACUATION PLAN FOR THE URBAN RIVERBANK RESIDENTS' -CONSIDERING THE ASANOGAWA RIVER OF KANAZAWA CITY-

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1. Introduction

Natural disaster, such as flood, hurricane, earthquake, is inevitable even though there are advanced technologies. It can cause disease, scarcity, injury, accommodation loss, or even worse, loss of life. Therefore, effective evacuation planning is very important to reduce the losses.

As more and more people becoming affected by the impact of natural disasters across the globe, evacuation has been a common strategy for handling the emergency situations of disaster. Evacuation is a process in which affected people are displaced from dangerous places to safer places in order to reduce the health and life vulnerability. During disaster response, evacuation should be conducted accurately, and in a hurry. As a result, evacuation plan is very important to mitigate the effect of an emergency or disaster on a community. However, evacuation planning is a very complex problem involving many behavioral and management facets.

There are different studies in evacuation planning that work from different perspectives such as evacuee behaviors, traffic control strategies, sheltering site selection, and route finding for displacement.

2. Purpose of the study

These days a large amount of heavy rain (that is called a guerrilla heavy rain) has been observed in some localized area of Japan. This torrential downpour transformed a normally calm area into a powerful river of death in only a few short minutes. Many people are caught unprepared for the power and speed of a flash flood, which results in dangerous situations. This destroys lives and things badly. People died in the sewer construction spot in Tokyo at the time of heavy rain disaster. Especially in 2008, this heavy rainfall observed mainly in the district of Tokai and Kanto and in Kanazawa city of Ishikawa.

Kanazawa City has been confronted with severe flooding at the end of July. One early morning heavy rainfall made the Asanogawa River overflows, flooding the surroundings streets and districts. A lot of people have been affected by this heavy rain fall. It is the first time in 55 years that rainfall more than 100mm in Kanazawa for one hour. The evacuation guidance started to about 20,000 household in Asanogawa abandonment areas. It was taken a lot of restoration and this are also going on still now. Besides of a lot of activities regarding this disaster, it was said that the evacuation plan was not sufficient around the Asanogawa River.

I intend to study about a future evacuation plan to save lives and things more effectively who are living on river banks like Asanogawa River in a city at the time of disaster.

3. Methodology of the study

To achieve the purpose, this research will be followed by a questionnaire survey method using simple statistical analysis. As a method of study, the flow is as below-

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[*]Key Words: Disaster prevention plan

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- Collect and understand the questionnaire survey data of Asanogawa River
- Analysis the survey data
- Define the result of the study and think about more effective evacuation plan considering the Asanogawa River of Kanazawa.

4. Increasing Frequency of Heavy Rains in Japan

In Japan, the trend of increasing frequency of heavy rain is expected to continue. Both hourly and daily rainfall tends to increase. As a result, sometimes these lead to a flash flood in the localities like Asanogawa river bank residents of Kanazawa.

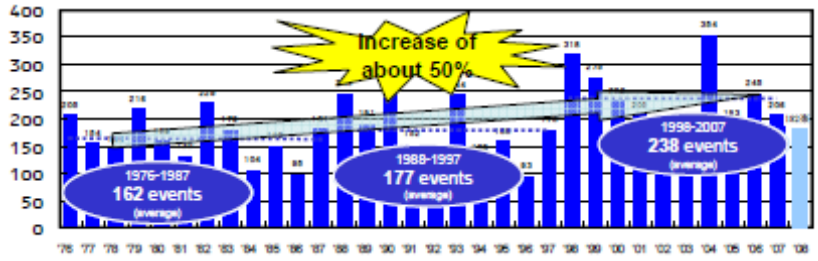

Figure 1 shows annual frequency of 50 mm/hour or more precipitation events (per 1,000 localities)[2)]

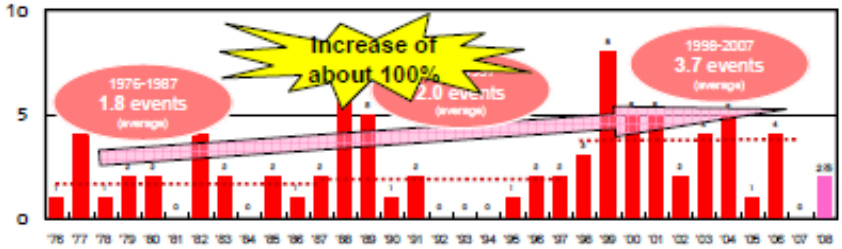

Figure 2 shows the annual frequency of 100 mm/hour or more precipitation events (per 1,000 localities)[2)]

In the below figure 3, there is a period precipitation distribution (July 27th ~29 day) of Ishikawa and Toyama prefecture.

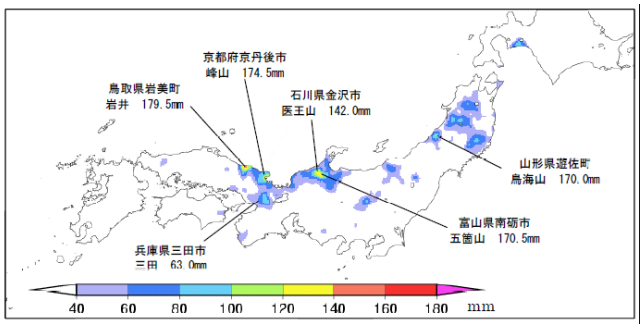

Figure 3: Recording the fierce rain which exceeds time rainfall 100mm[3)]

5. Questionnaire Survey Of Asanogawa River Flood Disaster

Recently it has been taken a questionnaire survey among the resident living around the Asanogawa River from our laboratory. The survey was performed regarding the flood disaster that occurred on 28th of July. It was performed within 35,421 households of reputation figures by the inundation damage of flash flood. The survey observed from the 1st September to 4th September. The methods of collecting information are postal surveys.

Table 1 shows summary of the distribution and collection of questionnaire survey that was performed by our laboratory concerning the guerrilla heavy rain on July, 2008.

Table1: Distribution and collection of questionnaire

Number of the zone or area	12
Population Size(Number of population)	86,570
Number of the households	35,421
Number of the households sampled	9,750
Number of the respondents	1,970
Response rate(%)	20

A) What was the purpose of the questionnaire survey?

The main purpose of the questionnaire was – a) to understand the actual situation of the affected area for the flood of Asanogawa River, and b) to clarify the real condition of evacuation guidance plan on the disaster day.

B) What kind of questions was delivered to answer?

There were 4 main questions for the responders. They are-

(1) The actual situation of the disaster day

(2) Satisfaction to the correspondence for the disaster management (to understand the situation of delivered information).

(3) Understanding about the consciousness of the affected people.

(4) A personal attribute

6. Data Analysis and Result Discussion

(1) Evacuation information announcement situation in the different districts

In this section, about the figure 4, we try to understand the actual situation of the evacuation information presence at the time of the flood. It shows about the evacuation guidance activities regarding the information. Here it describes the overall situation of the announcement concerning with the information of preparations, evacuation advices and evacuation directives.

By the analysis of figure 4, we can understand that the availability of the announcement is different from place to place. It is observed that the rate of getting information is higher in the lower basin area of Asanogawa. It is also understandable that the rate of availability of announcement is becoming lower in the part of middle basin and upper basin gradually.

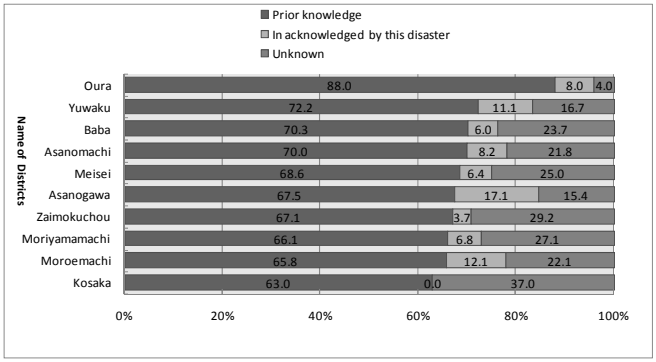

Figure 4 Announcement of the evacuation information n= 799

(2) Inundation situation in the comparison of basins

Here in below, Table 2 shows the Asanogawa River basins, Kanazawa city abandonment area district, households and the inundation situation of these districts on the disaster day.

Table 2: Asano basins, districts, households and damage

Basin	The district name	Number of the households	Inundation/damage
Upper basin	Yuwaku	462	Above the floor and the floor bottom
Middle basin	Zaimokucho	2,822	Partly
	Baba	1,508	Above the floor and the floor bottom
	Meisei	2,974	Above the floor and the floor bottom
	Kosaka	4,376	Partly
	Moriyama machi	3,606	Partly
	Asanomachi	2,820	Above the floor and the floor bottom
	Moroemachi	6,523	Partly
Lower basin	Asanogawa	1,769	Partly
	Oura	2,756	Partly

(3) Awareness of victims affected by disasters

In the survey, it was heard here about the awareness, administrative correspondence and flood control prevention measures against the disaster. Disaster-awareness regarding this Asanogawa flood disaster (e.g. not forgiven or not allowed, it is a limit for the response, no alternative) has been shown in the figure 5 below by counting the results according to the damage.

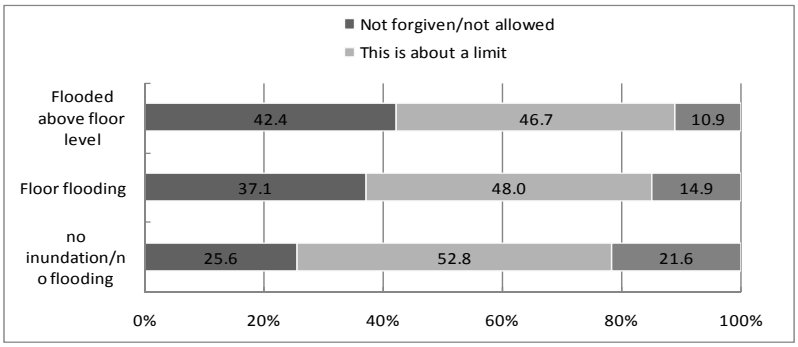

Figure 5: Awareness of the victims' n=1643

It becomes clear that the victims' consciousnesses are strong and the flood damage is big as they say "not forgiven". The opinions are different according to the areas.

(4) Administrative correspondence to flood disaster

It was asked to the respondents about the administrative correspondence against the flood disaster in the figure 6 shown below. What was the administrative support or movement (e.g. it was early, a little late, this is a limit and it was early) to help the affected people and save the wealth during flood disaster?

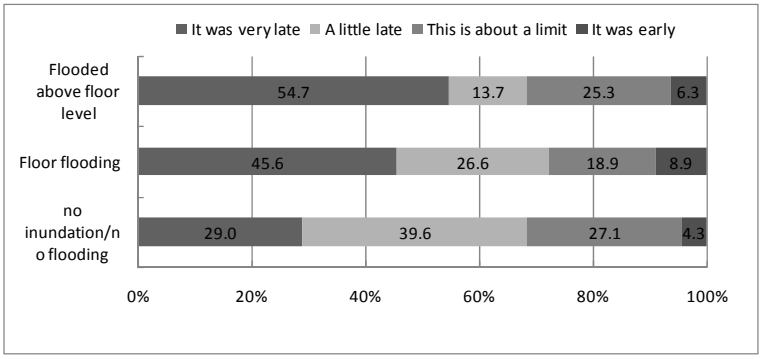

Figure 6: Administrative correspondence to disaster n=1643

By the analysis of figure 6, we can easily that the administrative (like city government or prefectural authorities) correspondence to the flood disaster was not good at all. Their activities observed delay for all over the flooded districts or regions.

7. Conclusion

This research tries to make some statistical analysis of the survey data. Here this study also tried to gather related information of the flood disaster. Furthermore, evacuation planning is the key study of this research which aims to improving the capacity of saving lives and wealth of the urban riverbank residents.

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