

# A STUDY ON MEASURES OF PROVIDING EVACUATION INFORMATION AT THE LOCALIZED TORRENTIAL GUERRILLA RAIN: THE CASE OF ASANOGAWA RIVER FLOOD

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## 1. Introduction

The starting point for this study is the need to develop existing method of providing evacuation information at the localized torrential rain. This study measures the providing evacuation information of the recent flood disaster of Asanogawa River, Kanazawa city, Japan. Kanazawa city areas around the Asanogawa River confronted severe flood disaster that occurred on 28<sup>th</sup> July, 2008. The localized torrential guerrilla rain transformed a normally calm area into a powerful river of death in only a few short times. Many people are caught unprepared for the power and speed of a flash flood, which results in dangerous situations. The localized torrential rain in the area around Asanogawa River brought inundation, flooding homes, causing landslides and leaving serious damage. In several areas where the river narrowed, or at bends, flood waters overflowed the dike. Because of delays in closing the flood gate, the river overflowed at opening in the dike called “Kirikaki”. The aim of this study was to analyze the survey data of Asanogawa River flood and then finds results of effectiveness of providing evacuation information taken by Kanazawa city government.

## 2. Rationale of the study

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. Several factors contribute to flooding. Localized torrential rain is one of them. In order to mitigate the devastating situation of the localities for flood disaster that is caused of torrential heavy rain, providing evacuation information has a great significant. Recently, localized torrential guerrilla rain occurred in many places of Japan as well as other region of the world. This heavy guerrilla rain often leads to flash flood, like Asanogawa River flood on July 2008. It destroy live and things badly.

This study was a survey based research of evacuation information plan regarding the guerrilla torrential rain. The final goal of this study is to find out the best possible way of providing evacuation information at the time of localized torrential guerrilla rain.

Table 1: Localized torrential guerrilla rain at some places in Japan of late years:

Date	Place	Rainfall (mm/h)
2000.9.11-9.12	Aichi	114
2004.7.17-7.18	Fukui	96
2008.7.28	Ishikawa	100
2008.8.26-8.31	Tokai, Kanto	100-120

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### 3. Increasing frequency of heavy rain 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. In figure 1 shows the annual frequency of 100 mm/hour or more precipitation events (per 1,000 localities)

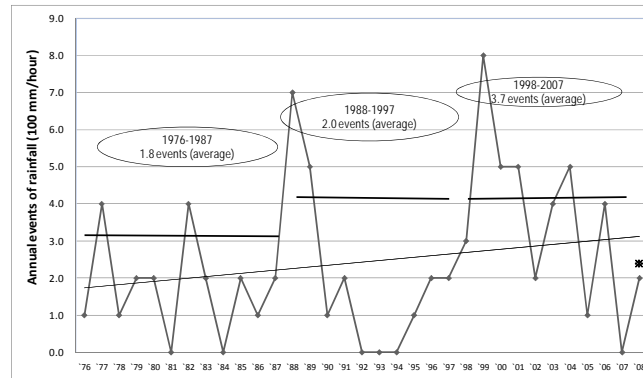


Figure 1: The annual frequency of 100 mm/hour or more precipitation events (per 1,000 localities)

### 4. Questionnaire survey of Asanogawa River flood disaster

It had been taken a questionnaire survey among the residents living around the Asanogawa River from our laboratory. The survey was performed regarding the flood disaster that occurred on 28<sup>th</sup> of July, 2008. The method of collecting information was postal survey.

Table2: Distribution and collection of questionnaire

Number of the zone or area	10
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

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 information plan on the disaster day.

### 5. Result discussion of the survey

#### (1) Inundation situation in the comparison of basins

The survey investigated the most affected areas of Kanazawa city for the flood by the torrential guerrilla rain on 28<sup>th</sup> July, 2008. Here below the table shows the Asanogawa River basins, Kanazawa city abandonment area districts, households and the inundation situation of these districts on the disaster day. The objective of this part of survey is- (a) to understand the actual inundation situation in the city of Kanazawa, (b) to keep inundation damage records for the future reference.

Table 3: Asano basins, districts, households and damage

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

## (2) How the disaster affected people's normal life:

Here it is tried to clarify how the disaster affected the normal life especially the actual condition of commuting work place (e.g. office etc) and attending school of the residence on the disaster day.

The main purpose is:

- First, whether they commute or went to school as usual
- Second, if they had experienced significant delays in the commuting time.
- Third, if they had changed their means of transport.

The result is shown by figure in below.

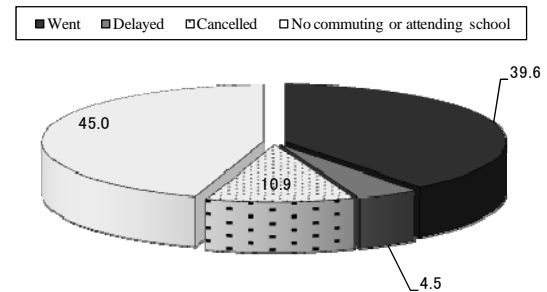


Figure 2: Actual condition of commuting and attending school

## (3) A comparison between different sources of information acquisition:

Good communications with the public is one of the most important elements of an evacuation plan. The city government evacuation plans should have adequate provisions for communicating basic information to residents about when they should evacuate, the designated evacuation routes, what they should take with them, the location of shelters, and other information needed before they evacuate.

Here in the figure, this study try to presents the response rate for different sources of providing evacuation information to the residents around the Asanogawa river of Kanazawa city.

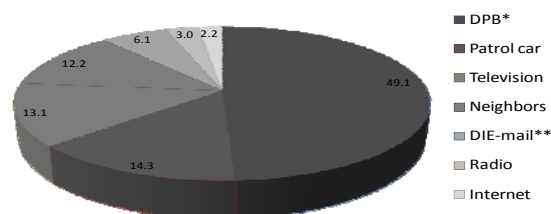


Figure 3: Response rate for different sources of providing evacuation information n=799

The analysis of the data, it is observed that the highest rate of acquisition of information is DBP then patrol car and then gradually television, neighbors, DIE-mail, radio and internet.

#### (4) Sources of information acquisition within different professions:

This study analyzes the methods to distribute evacuation information to the people of different profession, in order to investigate ways of providing information to maximize evacuation effectiveness and minimize flood damage. The Sources of providing evacuation information is as same as mentioned previous chapter. Here now I describe about the different professions.

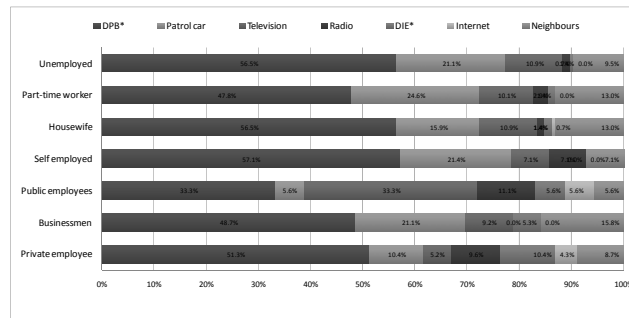


Figure 4: Source of Information acquisition within different professions n=629

By analysis of the figure 4, it is noticed that the acquisition method DBP is the highest response among the people of different kind of profession. Then the patrol car and television is playing important role as a providing information method. A lot of people get information from their neighboring people. The response rate of DIE-mail is higher in the public employee, private employee and businessmen

#### (5) Information acquisition level about the evacuation place

In this part, the questionnaire is designed to grasp the evacuation situation of the residents according to their acknowledgement of evacuation preparation information. The city administration made announcement and call the affected people for taking evacuation. Safety Evacuation Areas and shelters (e.g., elementary and junior high schools) have been established to accommodate persons who must evacuate their homes because of difficulty in daily living, due to damage from earthquakes, typhoons or floods, as well as for other natural disasters.

Here it is analyzed about the effect of administration announcement to the victims for taking their evacuation in the designated shelter places of the city.

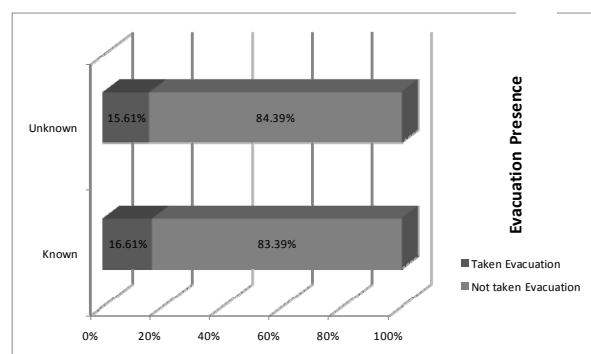


Figure 5: Rate of taking evacuation versus evacuation preparation information n=1,357

#### (6) Administrative responsiveness to flood disaster

It was asked to the respondents about the administrative correspondence against the flood disaster in the figure 3 shown below. What was the administrative support or movement (e.g. it was very late, a little late, this is a limit and it was

early) to help the affected people and save the wealth during flood disaster? The figure shows here that more than 40% people said that the administration correspondents were very late to the flood disaster.

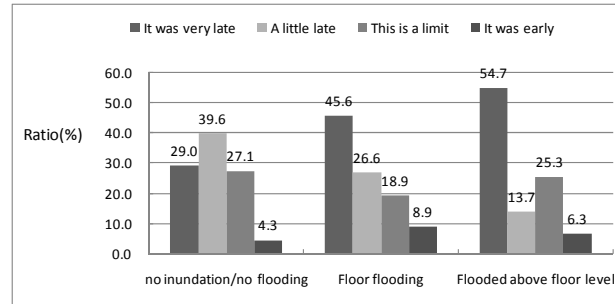


Figure 6: Administrative correspondence to disaster n=1643

#### (7) Appropriateness of the aspects of evacuation information:

Table 4: Appropriateness score for 5 different contents

Appropriateness score for different contents				
5	4	3	2	1
Completely appropriate	Appropriate	Undecided	Not appropriate	Completely inappropriate

Here the intention of the analysis was to find out the appropriateness score according to the function of evacuation presence (e.g. evacuation taken or not taken). The appropriateness score measured in the contrast of five different aspects. And they are in the table 5 in below.

Table 5: Aspects of evacuation information

*TEP: Timing of evacuation preparation
*TEA: Timing of evacuation advisory
*TED: Timing of evacuation directive
*AS: Administrative support
*VS: Volunteer support

The result will be displayed by the figure 7 in below. The total mark of score point is 5.

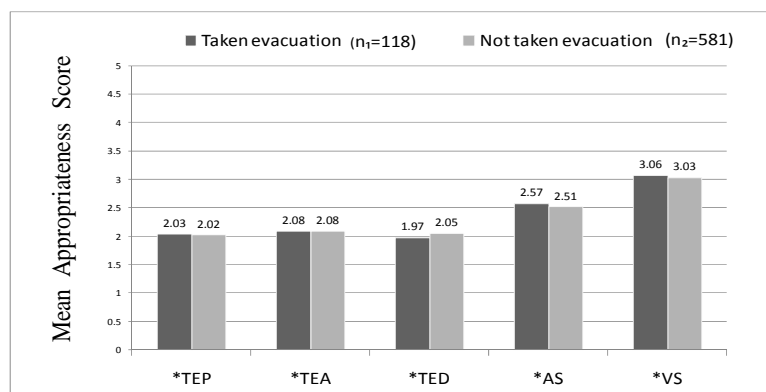


Figure 7: Appropriateness of the aspects of evacuation information:

The findings of this section of figure 7 are: Volunteer support gets highest score that is 3.06 for taken evacuation and 3.03 for not taken evacuation. So we say that the support from was significant. The degree of appropriateness for other aspects like TEP, TEA, and TED and AS became lower than 3 points. The degree of appropriateness for the whole activities was not significant.

## 6. General Discussion

The purpose of the study was to measure the effectiveness of the existing method of providing evacuation information regarding the questionnaire survey of Asanogawa River flood which occurred on 28<sup>th</sup> July, 2008. The analysis of the collected data revealed the magnitude of the actual disaster situation and the effectiveness of the evacuation information plan taken by the city government.

- (1) The data of the actual situation for the disaster shows that inside of the city area e.g. the middle basin area was affected very much by the flood.
- (2) It is also evident that people's normal life was affected to some extent such as the terrible flood situation hampered the commuting work place or attending school on time.
- (3) In the data analysis shows that the responsiveness of the concerned authority was not effortful. The city had taken steps for the flood disaster in delay. As the 50% of the residents thought that the city's correspondence to the flood disaster was very late.
- (4) The appropriateness score of the different aspects of the evacuation information was below 2.5 points out of 5 points. It means that the degree of appropriateness for the whole activities was not successful.
- (5) Among the people of known and unknown of evacuation preparation information, the percentage of taking evacuation is very low. So it can be said that the evacuation information announcement could not able to motivate the residents for taking evacuation properly.

Taken all the results together, it can be said that the measures taken by the city government for the people's rescue from such devastating situation was not satisfactory.

## 9. Conclusion and future plan

This study tries to measure the effectiveness of the method of providing evacuation information taken by the city government. Two findings were obtained through this study. First, the method they used was unsuccessful. It did not help the effected people for taking their evacuation properly. Second, there is a scope to rethink about the methodology of providing evacuation information which should be directed towards human welfare.

As there is no doubt that the method of providing evacuation information was ineffective and disappointing. Now it needs revision. For this purpose, my future plan of this research would be

- 1) To spot out the weakness of the existing method of providing evacuation information plan
- 2) To propose an ideal method correcting all the fault of existing method.

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