

An Investigation on Flooding Perception along Erren River Bank in Tainan, Taiwan

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Abstract Due to the impact of global climate change, the urban flooding in Taiwan occurs frequently, causes serious damage. Understanding the disaster perception is desirable in order to implement the urban disaster management. This paper aims to investigate the flood perception of residents along Erren River Bank in Tainan, Taiwan by using questionnaire survey method. The findings show that the residents tend to be at peace with flooding. Compared to the disaster resistant implement by government, the residents believe that the adoption of autonomic disaster resistant action will decrease the flooding damage effectively.

Keywords Flooding, Damage, Disaster perception, Disaster management

1. Introduction

Taiwan is located in the subtropical region and the western North Pacific typhoon belt, in which the rivers are torrential because of rugged terrain and short streams. The rainfall seasons in Taiwan concentrates on July to August, which often brings heavy rain to cause serious flooding disaster in Taiwan coastal and low-lying areas. According to statistic data of Taiwan Fire department, a total of 350 typhoons and at least 1000 torrential rains attacked Taiwan in the past 100 years. It can be seen that flooding is the most serious natural disaster in Taiwan. To sum up disaster damage in the years of 1958-2000, there are 108 deaths, 250 people injured, 3458 buildings destroyed and 5575 buildings half-destroyed. To convert disaster damage into currency, the average damage of flooding disaster per a year before 1990 years approached 5.5 billion NT dollars and that after 1990 years exceeded 30 billion NT dollars. It is obvious that the disaster damage of flooding increases gradually year by year. The flooding disaster is induced by multi-factors including torrential rain, abundant sediment, poor drainage, improper land development and so on. Based on historical records, several typhoons, the 2009 Morakot typhoon and the 2013 Kong-rey typhoon for example, hit Taiwan, and brought abundant rainfall to cause serious damage, especially in Tainan, Taiwan.

There are a lot of studies in disaster risk and disaster preparedness plan for disaster mitigation. The disaster

perception was also addressed because the disaster perception contributes to mitigation works. Wong and Zhao (2001) pointed out that people live in the flood-potential area because of high population density and limited dwelling and residents do not longer care about flooding control engineering. Instead, residents mind emergency relief and the post-disaster recovery action. The similar phenomenon occurs in Bengal and the residents in Bengal are ready to live with flooding (Rahman, 1996). In addition, 69%-86% residents in the Freiston coast of England thought the coastal protection measures is necessary for prevention from flooding and only 36%-50% residents believed the decision made by government departments (Myatt et al., 2003). Chen (2005) investigated the disaster risk perception of residents in disaster areas to supply a basic data of disaster risk management. This paper aims to investigate the disaster perception of residents in the disaster potential area. The Tainan located in south Taiwan is selected in this paper. The analysis findings will supply a helpful reference for mitigation works.

2. Method

2.1. Study Design

The close-ended questionnaire survey is adopted to explore residents' perception and attitude toward flooding disaster in this paper. The familiar Likert five-point scale from "strongly disagreeable" to "strongly agreeable" is measured. Except for demographics, the questionnaire consisted of eight sections comprising a total of 52 items (see Table 1).

The first section of the questionnaire includes possible

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factors lead to flooding occurrence. The second section of the questionnaire investigates possible action reducing flooding damage. The third section explores response after issuing a heavy rain warning. The fourth section surveys the possible worry about flooding damage. The fifth section examines information sources to make a decision of evacuation. The sixth section investigates the disaster prevention strategy of government for residents. The seventh section is to understand residents' worry when leaving home to take refuge. The eighth section investigates residents' satisfaction degree for residence. The demographic items included sex, age, and highest education.

In this paper, a reliability scale test is carried out for all sections in order to assessing the internal consistency of variables. According to document of Babbie (1992), the value of Cronbach's alpha was classified based on a reliability index in which 0.90 – 1.00 is very high, 0.70 – 0.89 is high, 0.30 – 0.69 is moderate, and 0.00 – 0.29 is low. As shown in Table 1, the resulting alpha values ranged from 0.65 to 0.89, which fall into the classification of moderate and high and very high. That is to say, the alpha values in this paper are within the acceptable range to assure reliability.

2.2. Sample Selection and Data Collection

The sample is randomly selected from four villages of Rende district, Tainan city, Taiwan including jhong-sheng village, bao-an village, er-sing village, and tai-jia village. These villages spread along Erren river bank and experienced several flooding induced by typhoon. In this paper, the door-to-door questionnaire is conducted. According to household data, there are 881 households in the study area and a sample of at least 268 households is targeted with a significant level of 95%. In this paper, of 270 households sampled, 16 questionnaires are unusable because the answer is not well completed. Thus, complete

questionnaires are obtained from 254 households for an effective response rate of 94.07% and a significant level of 94.8%.

Of the respondents, majority of respondents are men with a rate of 66.5%. 42.2% are aged between 31 to 49 years old and 31.5% are aged between 21 to 30 years old. 49.6% had a bachelor diploma and 36.2% had a degree of high school.

3. Findings

Table 1 provides a summary of the means and standard deviations (SD) of sections and items. The items within each of sections are summed to obtain a mean score. The findings are listed as follows.

- The major factors leads to flooding are “houses below the pavement”, “water does not discharge due to rising tide” and “water from outside overflow embankments”.
- Implementing the necessary evacuation, joining disaster exercises held by community and requesting government to arrange evacuation lines and shelters can reduce the flooding damage.
- Checking gas and wires, paying attention on any holiday and purchasing consumer goods are the popular responding behaviors when a typhoon warning is issued.
- Losses of housing price, crop and production equipment will bring residents a serious harassment. It should be noted that losses of life, health and psychology is minor for residents.
- Information sources to make a decision of evacuation come from the village chief or fire Department, neighbors, relatives and friends, and the elder or adult children

Table 1. Summary of means and standard deviations (SD) of sections and items

sections/items	Mean	SD	Cronbach's α
<i>1. What are major factors leads to flooding</i>	3.36		
A1. Small drainage	3.39	1.765	0.65
A2. Lowland terrain	3.06	1.653	
A3. Houses below the pavement	3.79	2.008	
A4. Heavy rain	3.13	1.750	
A5. Water does not discharge due to rising tide	3.64	2.143	
A6. Drainage is blocked	2.88	1.674	
A7. Water from outside overflow embankments	3.62	2.152	
<i>2. Which action will be taken to decrease the flooding damage</i>	3.72		
B1. To clean the drainages close to home	2.96	1.853	0.82
B2. To request government to rebuild embankments and drainages	2.96	1.914	
B3. To join disaster exercises held by community	4.36	2.140	
B4. To carry out the necessary evacuation	4.48	2.264	
B5. To request government to arrange evacuation lines and shelters	3.84	2.253	

Table 1. Continue

sections/items	Mean	SD	Cronbach's α
3. Which response will you take when issuing a typhoon or heavy rain warning	3.18		
C1. To move car and furniture	2.56	1.457	0.69
C2. To set up waterproof sheet	2.72	1.850	
C3. To pay attention on any holiday	3.53	2.235	
C4. To check drainages around home	2.96	1.920	
C5. To check roofs and windows	2.96	1.708	
C6. To repurchase consumer goods	3.09	1.726	
C7. To check gas and wires	4.08	2.075	
4. Which flooding loss will induce serious worry for individuals and family	3.35		
D1. Loss of housing	2.97	1.626	0.77
D2. Loss of crop	4.08	2.329	
D3. Loss of business and revenue	3.16	1.724	
D4. Loss of job	2.99	1.729	
D5. Loss of Environmental health	3.13	2.012	
D6. Loss of car or electrical appliance or decoration	3.17	1.866	
D7. Loss of running water and electric power equipment	3.83	2.203	
D8. Loss of housing price	4.30	2.133	
D9. Loss of production equipment	4.04	2.169	
D10. Loss of life	2.69	1.428	
D11. Loss of health	2.96	1.893	
D12. Loss of psychology	2.88	1.737	
5. Which information is used to judge whether evacuate or not	3.01		
E1. Television and radio	2.66	1.698	0.73
E2. Village chief or fire Department	3.50	2.068	
E3. Neighbors, relatives and friends	3.25	1.884	
E4. Oneself or spouse	2.64	1.640	
E5. The elder or adult children	3.02	1.733	
6. What action can government take to reduce flooding damage	2.88		
F1. To set up drainage	2.34	1.361	0.71
F2. To set up seawall and river bank	2.41	1.460	
F3. To set up basin detention ponds	2.63	1.656	
F4. To issue damage compensation or grants	2.13	1.407	
F5. To issue interest subsidies and tax reduction	2.37	1.579	
F6. To purchase product soaked in water	3.83	2.242	
F7. To hold disaster prevention lecture and drills	4.31	2.115	
F8. To provide timely disaster prevention information	3.65	1.984	
F9. To provide punching bags and waterproof sheet	2.28	1.506	
7. What do you worry about when leaving home to take refuge	2.74		
G1. Physical and mental health of the elderly, women and children	2.70	1.495	0.71
G2. House, car and furniture	2.85	1.443	
G3. Economic damage and burden	2.65	1.601	
G4. Job damage and burden	2.75	1.609	
8. Satisfaction degree for current living environment	4.35		
H1. I am very satisfied and do not intent to move to another destination	4.00	1.973	0.89
H2. I will recommend my friends and relatives to live here	4.62	1.984	
H3. I will let my descendants to live here continually	4.42	2.016	

1= strongly disagreeable, 2= disagreeable, 3=common, 4=agreeable, 5= strongly agreeable

- For residents, holding a disaster prevention lecture and drills, purchasing product soaked in water, and providing timely disaster prevention information will reduce the flooding disaster. However, issuing damage compensation or grants, providing the punching bags and waterproof sheet, and rebuilding drainage cannot decrease the flooding disaster.
- House, car and furniture, and job are major harassments when people decide to leave home to take refuge.
- The average satisfaction of dwelling is high for residents living along Erren river bank, Taiwan.

4. Conclusions

The disaster occurrence is closely related to residents' reactions. Thus it is necessary to explore risk perception, attitude and behaviour of disaster for implementing the disaster management strategy. These residents along Erren river bank, Taiwan are selected and the questionnaire survey method is adopted to understand their flooding perception. The study results show that residents tend to be at peace with flooding, which is consistent with the study of Rahman (1996). Moreover, compared to disaster prevention by government, the autonomous disaster prevention is possible to reduce the flooding damage for residents.

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REFERENCES

- [1] E. Babbie, The practice of social research. California: Wardsworth Publishing Company, 1992.
- [2] L.B. Myatt, M.D. Scrimshaw, and J.N. Lester. Public Perceptions and Attitudes towards a Forthcoming Managed Realignment Xcheme: Freiston Shore, Lincolnshire, UK. *Ocean & Coastal Management*. 2003, 46:565-582.
- [3] A. Rahman. Peoples' Perception and Response to Flooding: the Bangladesh Experience. *Journal of Contingencies and Crisis Management*. 1996, 4(4):198-207.
- [4] K. Wong, and X. Zhao. Living with Floods: Victims' Perceptions in Beijiang, Guangdong, China. *Area*. 2001, 33(2):190-201.
- [5] L.C. Chen. The report on risk perception of flooding and debris, Taipei: National Science and Technology Center for Disaster Reduction.