

EVACUATION BEHAVIOR OF THE RESIDENTS IN HIGASHIMATSUYAMA CITY DURING 2019 TYPHOON NO. 19 (HAGIBIS)

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1. INSTRUCTIONS

Record-breaking rainfall associated with Typhoon Hagibis (Typhoon No.19) in October 2019 caused extensive damage over a wide area in eastern Japan.

In Higashi-Matsuyama City, (Saitama, Japan), rivers overflowed, damaging a total of 770 homes. In addition, issues in realizing safe evacuation, such as delays in evacuation and insufficient capacity of evacuation shelters (including parking lots), were brought to light. On the other hand, after the July 2018 torrential rains, governments and research institutions compiled reports on damage and evacuation behavior, indicating challenges[1].

In this study, a questionnaire survey on evacuation behavior was conducted, and a model analysis was conducted on whether or not horizontal evacuation was implemented and the timing of the implementation of evacuation, respectively.

The objective of this study is to determine what factors help achieve safe evacuation.

2. SURVEY OVERVIEW

In this study. A questionnaire survey was conducted among Higashi-Matsuyama citizens to collect data on their evacuation behavior. Questionnaires were distributed to those who evacuated to shelters and those who did not evacuate, each with different questionnaires.

The questionnaire surveyed respondents on their actual evacuation actions, preparedness for natural disasters, future countermeasures, and demographics of respondents.

3. ESTIMATION RESULTS

A binomial logit model was estimated by analyzing the factors that influence the choice of whether or not to evacuate horizontally, based on the results of the questionnaire. Table 1 shows the estimation results.

The results suggest that those who have experience in evacuation, those who expect their homes to be damaged, and those who are raising children (under 40 years old and living with their children) are factors that encourage horizontal evacuation.

The factors that influence the choice of evacuation timing were analyzed based on the results of the questionnaire, and a multinomial logit model was estimated. Table 2 shows the estimation results.

The results suggest that the perceived risk of wind and flood damage functions as a factor in horizontal evacuation prior to the issuance of disaster occurrence information.

Table 1. Horizontal Evacuation Choice Model Estimation

| Explanatory variable | Estimated value | t-value |
|--|---------------------|--------------|
| Experience of living in evacuation | <u>2.04</u> | 4.54 |
| Hazard map confirmation status | 0.75 | 1.51 |
| Assumed disaster situation | <u>1.27</u> | 6.19 |
| Hazard recognition status | 0.23 | 1.17 |
| Experience of natural disasters | 0.26 | 1.02 |
| Disaster information e-mail registration | 0.15 | 0.72 |
| Child-rearing generation | <u>0.94</u> | 4.12 |
| Constant term (Factors that selected "horizontal evacuation" not fully explained by the above variables) | <u>-0.58</u> | -3.08 |
| Degrees of freedom-adjusted likelihood ratios | 0.24 | |
| Target rate (%) | 74.5 | |
| Number of samples | 679 | |

Table 2. Estimation results of the model for selecting the start timing of horizontal evacuation

| Explanatory variable | Timing of evacuation | Estimated value | t-value |
|---|---------------------------------|--------------------|-------------|
| | | | |
| Recognition of wind and flood hazards | Issuance of evacuation advisory | <u>1.03</u> | 3.61 |
| | Issuance of evacuation order | <u>0.71</u> | 2.27 |
| Experience with natural disasters | Issuance of evacuation advisory | 0.41 | 1.05 |
| | Issuance of evacuation order | 0.74 | 1.77 |
| Confirmation of hazard map | Issuance of evacuation advisory | 0.36 | 1.14 |
| | Issuance of evacuation order | 0.19 | 0.52 |
| Disaster information e-mail registration status | Issuance of evacuation advisory | 0.09 | 0.32 |
| | Issuance of evacuation order | 0.04 | 0.12 |
| Constant term | Issuance of evacuation advisory | <u>1.11</u> | 4.63 |
| | Issuance of evacuation order | 0.1 | 0.35 |
| Degrees of freedom-adjusted likelihood ratios | | 0.24 | |
| Target rate (%) | | 77.5 | |
| Number of samples | | 522 | |

4. CONCLUSION

In this study, a questionnaire survey was conducted in Higashi-Matsuyama City, Saitama Prefecture, which was damaged by Typhoon Hagibis (Typhoon No. 19) in October 2019, and evacuation behavior was analyzed using a logit model. It was suggested that recognition of the risk of disaster in one's home leads to early implementation of evacuation actions.

REFERENCES

[1] Evacuation from Floods and Landslides in Light of the Torrential Rainfall in July, 2018 (Report), Central Disaster Management Council Disaster Prevention Measures Executive Council (2018)