

RESEARCH ON THE MEASURES AGAINST LARGE EARTHQUAKES AND TAKING REFUGE AT ONE'S OWN HOME

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The possibility of a huge earthquake striking Tokyo in the future is high. In the event of such an earthquake, many people will face problems such as the inability to return to their homes, which will cause complete disorder and confusion in the city as it will be impossible for everyone to access emergency shelters. If buildings remain safe, it will be desirable for residents to take refuge at home. In this study, we investigated the disaster awareness of 461 residents in central Tokyo using an internet survey. Our results reveal that approximately 60% of residents expect to take refuge at their own homes. However, almost none of the respondents have emergency supplies such as water, food, and other daily necessities. This lack of preparedness could result in many people having to move to emergency shelters when disaster strikes. By analyzing these results, we aim to develop a method for avoiding confusion in the aftermath of a disaster and educate building residents on their needs and the preparatory actions they must take in such situations.

Keywords: Disaster preparedness, Awareness of disaster mitigation, Evacuation activity, Shelter, Emergency supplies, Residents.

1 INTRODUCTION

If a huge earthquake strikes Tokyo, enormous damage will occur, owing to its high earthquake risk and large population. Damage to humans and buildings, which are direct consequences of the earthquake, are expected to be extensive, but a major obstacle can also hamper evacuation activities in the aftermath of the earthquake. In the center of Tokyo where the population density is high, the number of evacuation shelters is not enough; it will be impossible to accommodate all the residents. Therefore, in Tokyo, it is desirable for residents who are ensuring the safety of their home buildings to take refuge at home rather than at evacuation centers in case of an earthquake. This idea is also recommended by the government. However, while many of the citizens wish to spend a stress-free life at home following an earthquake, they also expect to secure their own space in evacuation centers and to receive supplementary supplies. In the Tokyo metropolitan area, where stockpiling and evacuation spaces cannot be secured, it is essential to maintain a reserve of food and beverages that will last more than a week with one's own stockpiles. For citizens to understand how to cope with the changes to lifestyle while taking refuge at home in the aftermath of a disaster, their awareness of evacuations and the actual state of their preparedness has been investigated in our previous studies (Shirai *et al.* 2011, Hirata *et al.* 2011, Takahashi *et al.* 2013, Hisagi *et al.* 2013).

As a result, it was revealed that many residents in the metropolitan area wish to remain at home after a disaster; however, their preparedness in terms of stockpiling is insufficient. Even though they have knowledge about the necessary amounts of stockpiles to be maintained, they have not taken any action in terms of being prepared. One of the influencing factors of these results may be people's optimism regarding damage estimation, such as their disregard for damage to life, expectation of prompt recovery after a disaster, and excessive expectation of administrative support.

Therefore, in this research, we investigated people's current perceptions of the damage estimate with the aim of broadening their knowledge so that they can properly prepare for evacuation or taking refuge at home in central Tokyo in the aftermath of an earthquake.

2 OUTLINE OF INVESTIGATIONS

Our survey respondents were 248 residents of high-rise condominiums (10 or more stories) and 213 residents of detached houses in the 23 special wards constituting central Tokyo. They were people in a position to manage stockpiles at home.

The survey was conducted between November 1 and November 7, 2016. The investigation assessed the respondents' awareness of disaster mitigation, earthquake preparedness, consciousness of refuge-preparation needs, etc. The investigation outline is given in Table 1.

Table 1. Outline of the investigation.

Investigation date	November 1–7, 2016
Investigation method	Internet questionnaire
Respondents	461 individuals: 248 residents of high-rise condominiums (10th to 74th floor) and 213 residents of detached houses. Respondents were between 25 and 85 years of age
Investigation topic	Awareness of issues and needs for disaster mitigation, preparedness for an earthquake, consciousness of refuge-building and supplies, knowledge about formal shelters, ability or willingness to take refuge in one's own home

3 SURVEY RESULTS AND CONSIDERATIONS

In the event of a major earthquake, we investigated whether ordinary citizens preferred to take refuge at their own homes or be evacuated to a shelter. The results are shown in Figure. 1.

Most citizens would prefer to take refuge at home than at evacuation shelters. It is noteworthy that few people, less than 5% of the respondents, wish to live in evacuation centers for more than a week.

Next, we investigated the extent to which the residents considered the damage estimate. Figure 2 shows the responses of residents to being asked how many restoration days are required for the resumption of their usual lifestyles and the restoration of important facilities that have been damaged by the earthquake.

Most citizens think that support and communication networks should be restored within three days, and they assume that they will be able to resume their normal lifestyles within a week. The number of days for restoration according to the assumption of experts and officials in Tokyo, the number of days it would take for complete restoration is one week for electricity, one day for water supply and sewerage, one month for gas, and two weeks for communication networks.

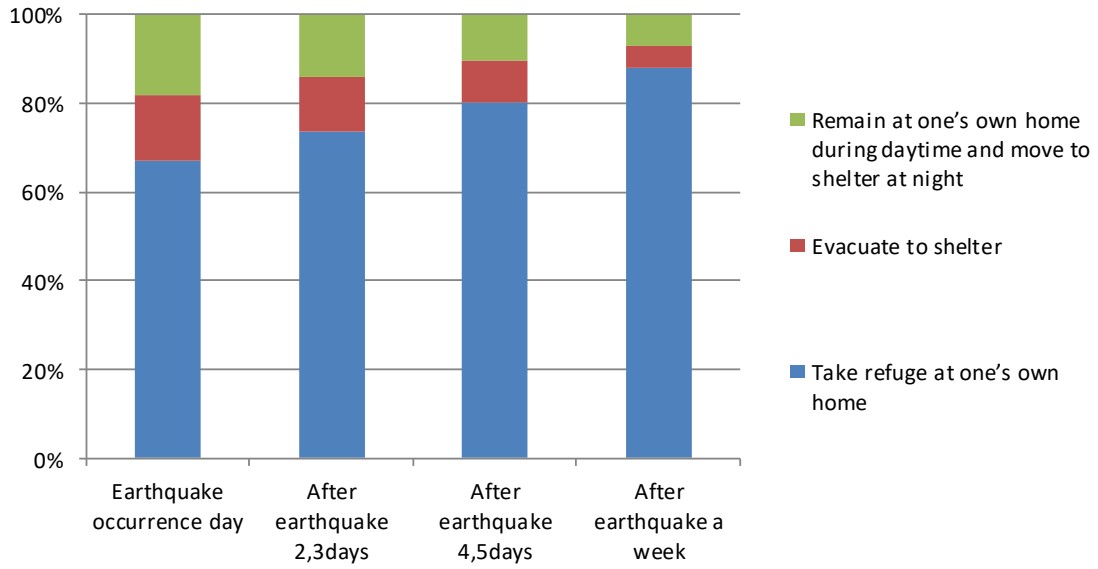


Figure 1. Places to which to evacuate after a huge earthquake.

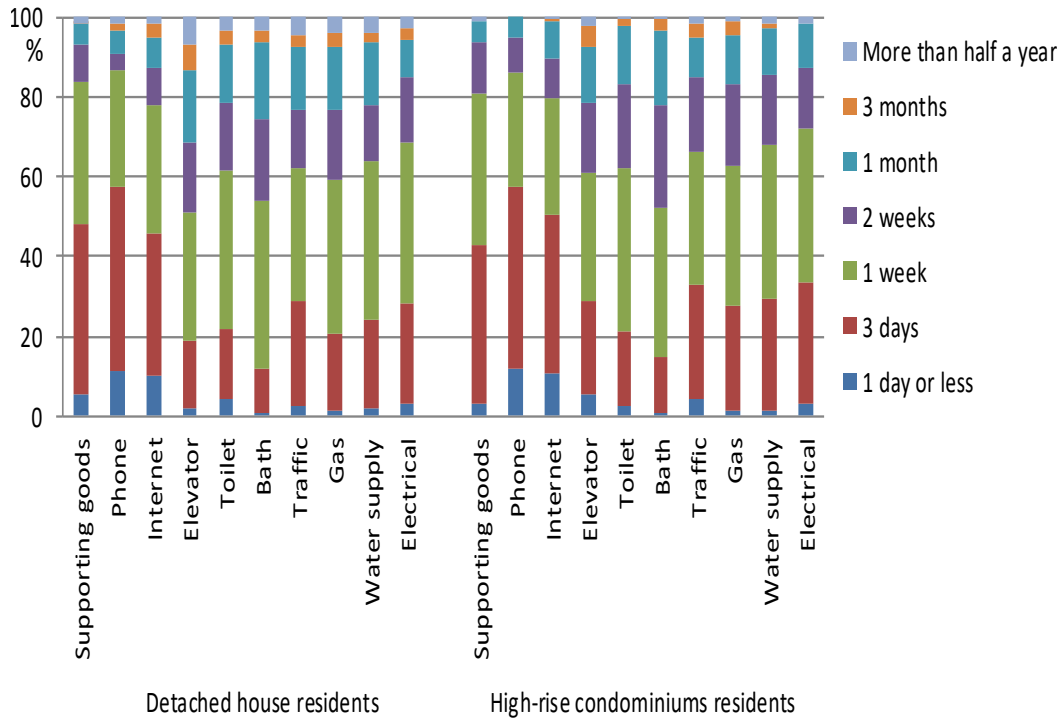


Figure 2. Expected restoration periods for various essential services that could suffer damage in the aftermath of a huge earthquake.

Therefore, when comparing these pieces of information, the citizens imagine the restoration period to be far shorter than it actually is in reality, indicating that their damage estimate is very optimistic. There was also a tendency for residents of houses to assume shorter recovery days

than detached residents. It was found that about 80% of all residents were not realistically aware of the difficulties of life after an earthquake.

This tendency to disregard the assumption of damage is considered to be one of the factors why people do not follow appropriate stockpiling behavior. Respondents who wished to live in evacuation centers after the earthquake estimated that restoration would be briefer than estimated by those who wanted to stay at home. Figure 3 shows the responses to inquiring about the reasons for respondents' estimation of the number of days it would take for restoration of essential services.

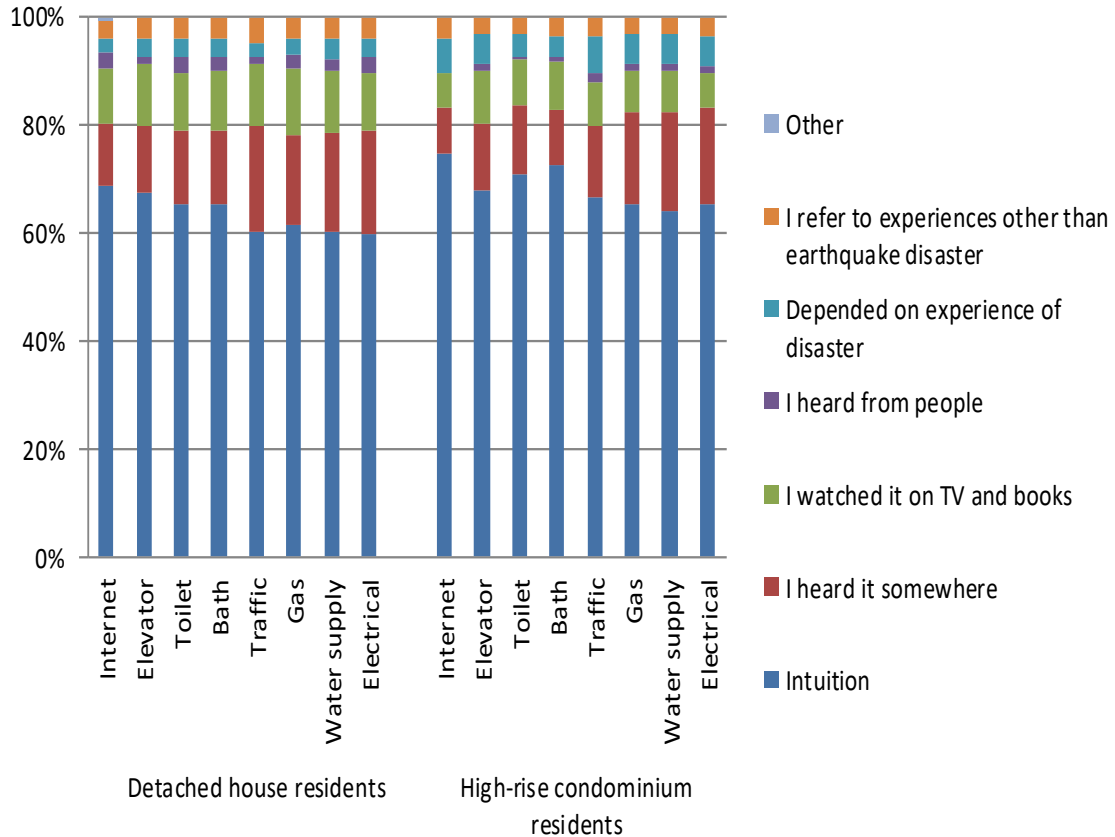


Figure 3. Reasons for respondents' estimation of the number of days for restoration of essential services.

“Intuition” constitutes approximately 60% or more of all responses, and the percentages of high-rise condominium residents are higher than those of detached house residents. In addition, the majority of respondents who expected that the number of days for restoration would be short made this judgment based on their intuition.

Furthermore, we investigated scenarios that would make respondents feel uneasy if a large-scale earthquake were to occur in the capital. The results are shown in Figure 4.

Anxiety about the complete destruction of one's home and concern about the breaking of furniture are more common among detached house residents than among high-rise condominium residents. In addition, similar shortages of stockpiles are found for both respondents who feel very worried and those who are not at all worried. The results of the survey revealed that most citizens were prepared for only about three days with their stockpiles of drinks and food. In the

case of the Tokyo metropolitan area, although stockpiles are required to last for seven days, this shows a clear shortage. However, many respondents did not feel worried.

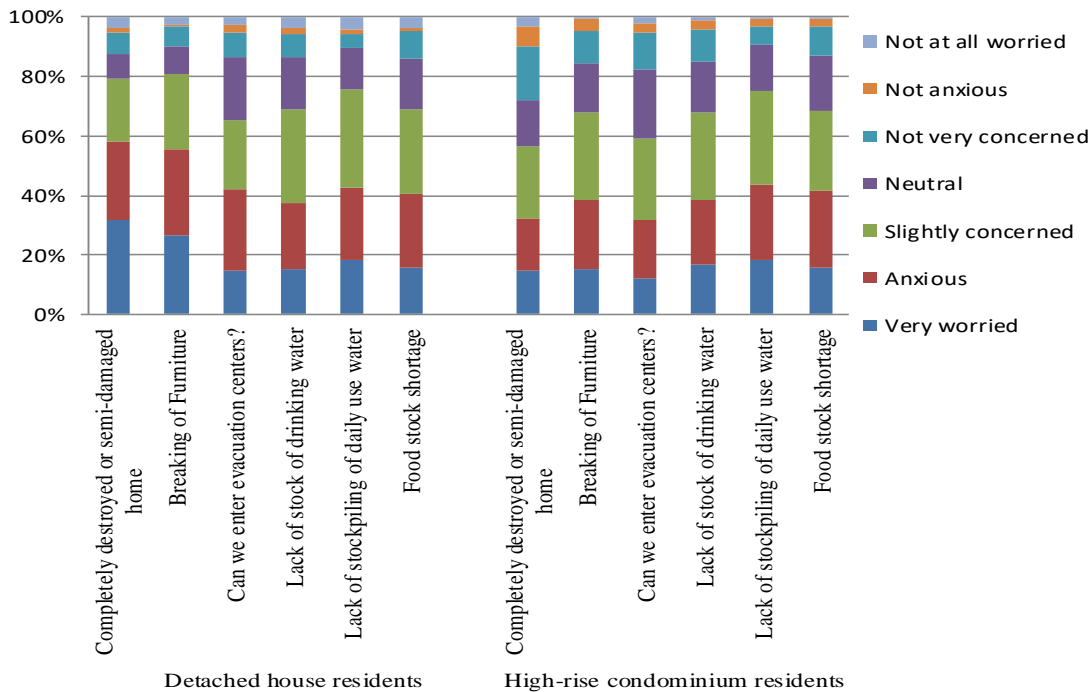


Figure 4. Major worries when an earthquake occurs.

4 CONCLUSIONS

Residents in central Tokyo are aware of the possibility of an earthquake that may directly hit the Tokyo area, but they tend to assume little damage, and they judge such possible earthquakes intuitively. In particular, residents of high-rise condominiums tend to estimate less damage than residents of detached houses. Most of the damage estimates are judged by intuition. These are considered to be some of the current factors that result in residents not maintaining sufficient stockpiles in order to help themselves in the case of a future earthquake.

In the future, it is necessary to consider investigating disaster information that makes people aware of accurate damage estimations.

Acknowledgments

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