A Research based Policy Implementation of Temporary Housing Preparations for an Anticipated Natural Disaster

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Abstract

In the long human history, many cities have been attacked by various natural disasters, such as earthquakes, tsunamis, floods, and volcano eruptions. Although emergency responses such as evacuation are important problems immediately after a disaster, it shifts to long-term disaster responses phase as time passes. For victims who are unable to live their home due to a disaster, temporary housings are required. A countermeasure for temporary housings is required quickly, however, it has many limitations in the confusion after a disaster. Therefore, effectual preparations before disasters will reduce many life sufferings of disaster victims.

The Great East Japan Earthquake and the Fukushima nuclear power plant accident has brought many widespread migrations who have to leave far from their familiar residences. At the same time, the Japanese Headquarter of Earthquake Research Promotion has pointed out that the occurrence probability of the anticipated Tokyo metropolitan earthquake and the Nankai Trough massive earthquake is high, and the Cabinet Office has released the damage assessments of those earthquakes. According to this assessment in case of the anticipated Tokyo metropolitan earthquake, 610,000 complete collapse buildings were expected. It will 1,500,000 households if it converts into the number of households. Many citizens want to continue living in their present living area, and the shortage of temporary housings will be difficult concern.

The Tokyo Metropolitan Government started the "Project proposal system from university researchers" from 2019 in order to utilize the knowledge of universities. The author proposed a policy project that will lead to concrete preparations for temporary housing in the anticipated disaster. The proposal was adopted by the Governor and it has been conducted under the agreement with the metropolitan government and Senshu university. The adopted project conducts several workshops among stakeholders including town officers, residential people, construction companies, welfare workers and so on using micro-simulation results of widespread migration. The interactions of each workshops are observed, and specialistic qualitative analysis will be performed by marketing researchers. And then, the project establishes an official investigative commission to recommends additional concreate preparations while learning workshop insights and knowledge from disaster affected area.

This paper summarizes, and, to some extent, expands on findings from Sato (2019), Chapter 5, Part 3, "Data Analysis of and Operational Proposal for Temporary-Housing Shortages."

1. Measures for Securing Housing for People Displaced by Major Disasters

From November 2016 to July 2017, the Cabinet Office organized a study group to explore measures for securing housing for people displaced by major disasters, and proposed topics of study. These suggestions included using empty homes as rented lodgings, supporting people needing special assistance, offering assistance for home repairs, and recognizing the difficulties in reaching agreements in multi-unit housing, with ideas for future action being recommended.

The study group's report estimated that following a hypothetical earthquake directly under the Tokyo area, the number of emergency temporary shelters needed would total 660,000 to 940,000 units. As the primary response to this massive demand, some 860,000 residential units could be provided on an emergency rental basis, while the number of emergency shelters that would need to be built was estimated to be less than 80,000.

However, of those residential units that could be provided on an emergency rental basis, the number that would actually be usable is unclear. Empty homes available for rent can also be expected to suffer earthquake damage, and not all empty houses would be available for temporary hire when we take into account rental conditions.

2. Additional Studies on Temporary Housing Supply and Demand

Sato(2017) calculated the expected supply and demand volume for temporary housing using a 2012 Cabinet Office study's estimate of damage from an earthquake directly under the Tokyo area, residential and land statistical surveys, and a large amount of online rental-home information.

This calculation was based on the fundamental units of local government (towns, wards, and villages) that would form the core of any disaster response measure. An earthquake directly under Tokyo would result in fire damage to an unknown but large extent. Calculations were performed for three scenarios – the best case scenario was noon time in summer with winds of 3 m/s, the intermediate case was evening time in winter with winds of 3 m/s, and the worst case was evening time in winter with winds of 8 m/s.

These calculations considered the number of completely destroyed households as the number of lost residential households. Sato(2017) also made a simplified calculation of the number of empty rental homes that would be damaged by the earthquake, and gave a break-up of the numbers for individual towns, wards, and villages. And it multiplied by the shares of residential types for each municipality to obtain a profile of available housing stock (typical floor plans, rents, etc.). Data on candidate sites for temporary-housing structures was requested and received from contacts in prefectural governments, and also gathered from public sources. By adding the number of usable empty rental homes to the number of temporary shelters that could be built, and then subtracting that sum from the number of displaced households, numbers representing the shortage in emergency housing were obtained.

As shown in Table 1, the calculation reveals that even in the best-case scenario of noon time in summer with 3 m/s winds, there would be a shortage of roughly 40,000 emergency residences in Tokyo's 23 wards. There would be a surplus of about 140,000 homes in Tama, so housing could be transferred outside the urban core. Looking at the 23 wards as a whole, we see a shortage of 40,000 residences, but on a ward-by-ward level, we see that there are 12 wards on Tokyo's east side in particular that have a shortage of roughly 130,000 emergency residences, including Sumida Ward (30,000)

and Adachi Ward (23,000).

Under conditions that are more likely to increase fire damage, i.e. night time in winter with 3 m/s winds, the shortage in emergency shelter across Tokyo's 23 wards leaps to roughly 460,000 units. Three adjacent prefectures have a surplus of about 600,000 units, which would result in demand for temporary housing to spread throughout the Metropolitan area. At the individual ward level, fire damage would put the west side of Tokyo also in a deficit position, particularly Suginami Ward (49,000) and Setagaya Ward (45,000), while15 wards taken together would have a shortage of 500,000 emergency residential units.

In the scenario with the worst fire damage, i.e. night time in winter with winds of 8 m/s, Tokyo's 23 wards would have an emergency housing shortage of roughly 640,000 units. Even when the surplus available in four adjacent prefectures is taken into account,

		calculation process (summer-daytime, WS:3m/s)			excess or deficiency of 3 cases		
prefecture	wards	households who lose their houses	rental housing	prefabricated temporary housing	summer- daytime, WS:3m/s	winter- evening, WS:3m/s	winter- evening, WS:8m/s
Ibaragi		800	79,000	18,900	97,100	97,100	97,100
Saitama		46,900	168,800	32,600	154,600	85,600	35,700
Chiba		27,700	157,700	45,700	175,700	154,100	130,300
Tokyo (wards area)		414,000	336,200	38,700	-39,100	-460,000	-638,800
	excess	-	_	-	88,700	54,600	44,100
	deficiency	-	-	-	-127,900	-514,600	-682,900
	Chiyoda	2,200	2,700	0	600	400	100
	Суио	5,200	5,300	400	600	100	-800
	Minato	5,700	9,200	300	3,700	2,800	1,700
	Shinjuku	11,500	16,900	800	6,300	1,600	-1,300
	Bunkyo	10,600	6,700	300	-3,700	-9,800	-12,700
	Taito	20,700	5,900	400	-14,400	-19,500	-23,900
	Sumida	38,300	7,800	500	-30,000	-45,000	-54,200
	Koto	22,500	12,700	600	-9,300	-18,600	-24,000
	Shinagawa	21,700	15,000	900	-5,700	-59,600	-73,800
	Meguro	13,400	9,000	600	-3,800	-28,500	-36,000
	Oota	41,500	36,900	3,900	-800	-77,800	-106,000
	Setagaya	22,700	24,800	2,900	5,000	-45,100	-66,300
	Shibuya	10,000	10,300	1,600	1,900	-4,800	-7,800
	Nakano	9,200	19,500	400	10,700	-6,600	-12,100
	Suginami	25,900	21,000	4,100	-800	-49,900	-63,800
	Toshima	5,800	20,300	300	14,900	12,200	10,600
	Kita	7,900	12,300	1,300	5,600	4,100	2,500
	Arakawa	20,400	6,300	300	-13,800	-28,600	-34,900
	Itabashi	5,300	20,000	900	15,600	14,300	13,100
	Nerima	8,700	21,200	11,400	23,900	19,000	16,100
	Adachi	41,000	16,400	1,200	-23,300	-54,400	-67,700
	Katsushika	27,900	15,200	1,300	-11,500	-31,000	-44,600
	Edogawa	35,800	20,800	4,200	-10,900	-35,500	-52,800
Tokyo (tama area)		12,600	139,700	14,900	142,100	134,000	129,800
Kanagawa		88,100	245,400	71,500	228,800	126,700	27,000
Total		590,100	1,126,900	222,300	759,100	137,700	-218,700

Table 1. Calculations estimating temporary-housing surplus and shortage

there would still be a shortfall of roughly 220,000 units. This is a number that the Tokyo suburbs cannot absorb, a situation in which a massive evacuation throughout the larger region would be inevitable.

Figure 1 shows the typical floor plans and rental value of houses that would be available following an earthquake at night time in winter with 3 m/s winds for different parts of the greater Tokyo area (Tokyo's 23 wards and the Tama area) Studio apartments (single rooms and single rooms plus kitchens, denoted as 1R and 1K) make up roughly half of the total. Given the rent requirement of JPY 75,000 or less specified by people who evacuated to Tokyo at the time of the Great East Japan Earthquake, roughly one-fourth of these would be found in the 23 wards of Tokyo, while more than half would be in Tama and other prefectures. Similarly, the baseline for households with five or more members was JPY 100,000. At this level, roughly half of the rest being in Tama or other prefectures.

It is believed that it would be effective to encourage disaster-stricken people to seek rental units or temporary housing as a way to provide rents that fall within their budget.



Figure 1: Characteristics of rental housings (winter, evening time, 3 m/s winds)

3. "Preparing for Temporary-Housing Shortages": Proposing and Implementing

We had the opportunity to present the results of our calculations to and share our ideas with some residents of two wards that are estimated to experience severe shortfalls in temporary housing. We also shared ideas about the problems that are expected not immediately after evacuation, but in the medium- to long-term. We were asked about upper limits on rents for rentable temporary housing and attitudes toward people trying to build their own temporary shelters so that they can remain in the area, which sparked a debate on systems and policies.

Starting in 2018, the Tokyo Metropolitan Government introduced the "Project Proposal System from University Researchers," with the goal of using the academic knowledge accumulated in universities around Tokyo to implement policies. In this connection, the authors proposed a project, under which people at the prefectural and municipality levels who will be responsible for disaster response, together with area residents who will be at risk of living in temporary housing, will work together to study issues and plans for disaster-affected areas, and discuss responses to expected conditions, which will lead to specific steps.

Of the 109 proposals presented, seven were adopted, including the authors' proposal (Tokyo Metropolitan Government 2019). Workshops and study groups will be convened over two years starting in fiscal 2019; the plan is to carry out widespread

publicity initiatives to reach out to residents and project members, and to study specific measures that can be taken (see Figure 2).

We would like to give some context to the proposed project. According to Tim Brown's book Change by Design, "design thinking" is distinct from design in the decorative sense, and is a strategic thought process for producing practical ideas. As part of this concept, he mentions "divergent thinking," a "human-centered approach," and "prototyping."

This is about actually observing what is happening in the real world: Watching what people do (or do not do), listening to what they say (or do not say), and looking at our own experiences. When we deeply observe human behavior, we can understand what is at the core of people's needs, which leads to the development of new services and products. This approach is the foundation of "design thinking."

Workshops are one of the specific techniques used to put "design thinking" into practice. In Workshop, the author Shoichi Nakanishi writes that an "observation research workshop" is an approach for winnowing out what people do intentionally and unintentionally and identifying new behaviors to extract latent needs and produce ideas.

In the proposed project, we make references to "design thinking" and "observation research workshops," and aim to bring to light a variety of techniques and responses for the social problem of quantitative shortages in temporary housing, which will be publicized and taught (self-help and mutual aid) to residents and project members. Based on the outcome, specific courses of action will be proposed to government bodies (public aid).



Figure 2: Overview of proposed project "Preparing for temporary-housing shortages"

4. Pre-Workshop Activities

In June 2019, we gathered 12 participants through publicity on the Internet and social media and held a trial run of a workshop. Of the participants, 11 worked in the private sector (four of them women, plus another woman of Chinese nationality) and one in local government (woman).

The workshop was run in phases, with one for defining problems and sharing ideas (40 minutes), one for providing additional information (40 minutes), and one for brainstorming ideas (100 minutes). First, we conveyed to the participants the hypothetical emergency of an earthquake directly under Tokyo and split them into three

groups to exchange ideas on "what you would do if your home was struck by disaster"? Next, we explained the possibility that there would be a significant shortage of temporary housing, and then asked them to come up with their own ideas for measures and actions that could be taken henceforth. We recorded the discussions, transcribed the tape, and later performed a qualitative data analysis on the content of the participants' statements.



Figure 3: Pre-workshop workflow

Figure 4 shows the process of our content analysis. To produce the transcript in Step 1, we stored all the comments as a time series. For the open coding in Step 2, we assigned codes to all of the statements related to a specific theme, and organized these by meaning. In Step 3, the "consolidation" process of focusing and summarizing revealed the background behind a statement's content. By using this process to analyze the statements, we hoped to obtain new insights.

The main findings from our pre-workshop were as follows:

- There is a great deal of anxiety about being evacuated to a distant location in an emergency.
- The anxiety about being evacuated to a distant location can be lessened through an "experience of prior interaction."
- Dual area living arrangements and remote work can be promoted as a way to deal with depopulation and emergencies.
- There is a need for advance information to deal with not only the immediate aftermath of an emergency, but also the mid- and long-term consequences.

In the future, we plan to conduct five rounds of workshops for those who will need assistance in a disaster – people in the private sector, residents, and government workers – and use the same approach to analyze the outcomes in each case to produce leaflets to distribute to city residents, hold town meetings, and offer proposals to the metropolitan government.



Figure 4: Overview of content analysis

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