

# Analysis of the allocation pattern of the temporary housing sites after disasters

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## ABSTRACT

This paper shows the influence of the temporary housing provision for the area recovery process after the disaster. I picked up two cases, the Great Hanshin-Awaji Earthquake as the urban area disaster and the Niigata-Chuetsu Earthquake as the local sites disaster. To analyze the temporary housing site location of these clarified the relationship between the distance from sites and municipality's offices and the areas recovery process. However the temporary housing provision sites were constrained by open space where the public sector freely used. Therefore, this paper shows that it is important to manage public owner's land at the pre-disaster time.

## Introduction

The temporary housing provision is the main method not only for recovery of sufferer's housing but also for a middle process of the regional reconstruction after serious disasters in the world. Many cases of cities devastated by great disasters faced this hard matter and carried out the mass temporary housing provision. The study identifies the underlying causes of the temporary housing allocation problem and clarifies the relation between this problem and the housing recovery process in Japan. This analysis picked up two cases, the Great Hanshin- Awaji Earthquake as urban area disaster, Niigata Chuetsu Earthquake as intermediate and mountain area disaster and showed the prediction of the future area reconstruction of the Great East Japan Earthquake case in the view point of the housing recovery.

## Analysis Results

### *Characteristics of Japanese Temporary housing provision*

Post-disaster temporary housing provision in Japan has the following three primary characteristics: (1) Housing is provided to people for whom housing recovery is problematic and its livability and convenience is extremely low compared with that of regular housing; (2) The uniformity of shape and efficiency and flexibility of use of temporary housing are low as it has the characteristics of public housing; (3) It is difficult to secure land when large amounts of housing is required, and the location of the housing effects the residents' ability to restore their livelihoods.

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## *The Great Hanshin-Awaji Earthquake Disaster Case*

To evaluate the provision of temporary housing after the Great Hanshin Earthquake, I defined the “centers of suffering” and calculated the locations of these centers. The results revealed that temporary housing sites were generally located in close proximity to the government offices of the municipalities in which they were constructed. Therefore, I clarified the distances between temporary housing sites and government offices as well as the numerical distribution of households and examined how such factors affected urban recovery and housing recovery.

I measured the distance between temporary housing apartments and the government offices of the municipalities in which they were constructed and analyzed the convenience of construction of the apartments from a broad perspective. The analysis involved calculating the distance between all temporary housing apartments and municipality offices (ward offices for ward areas and the location of the former town hall for Awaji Island) using GIS.

Trends in temporary housing provision vary according to the circumstances and strategies adopted by individual municipalities. Therefore, I examined differences in the number of temporary houses provided by each municipality after the Great Hanshin Earthquake.

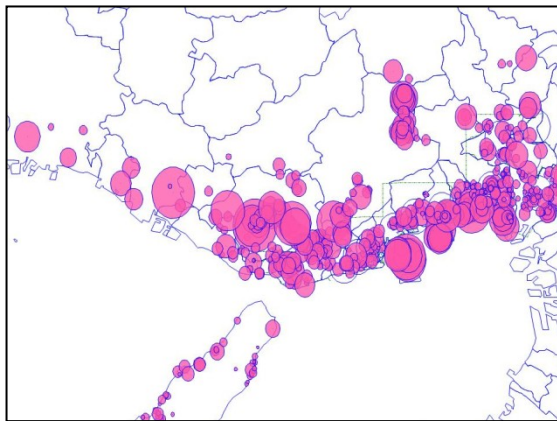


Figure 1. Sites location: Hanshin-Awaji

Table 1. Number of units and sites: Distance(km) from temporary housing sites to city offices

distance	0-2	2-4	4-10	10-	total
units	11,079	10,584	7,273	17,691	46,627
	24%	23%	16%	38%	
sites	206	157	70	137	570
	36%	28%	12%	24%	

Table 2. Number of units within 2km of the city offices

city	total units	0-2	%	
Kobe	29,223	5,704	19.5%	※to ward office
Nishinomiya	4,904	1,346	27.4%	
Ashiya	2,900	2,788	96.1%	
Amagasaki	2,218	620	28.0%	

The locations of temporary housing in each municipality were determined by the configuration of vacant space prior to the earthquake. However, the suitability of spaces as temporary housing sites, access to transport, and, to some extent, size varied according to factors such as apartment allocation strategies of individual municipalities; it was not always possible to conduct advanced assessments of these locations on the basis of the availability of large parks and vacant spaces.

Despite their high vulnerability to disasters, many Japanese city centers have very few vacant spaces and parks. Securing spaces close to government offices for use during disaster is extremely important and doing so will definitely help municipalities to respond to disasters and implement recovery and reconstruction operations. The appropriate allocation of such spaces in urban centers is crucial for securing tenacity in the face of disaster.

### *The Niigata-Chuetsu Earthquake Disaster Case*

This had the characteristics of the local area disaster. In the Niigata-Chuetsu Earthquake Disaster Case, 3460 units of the temporary housing were provided on 13 municipalities. But housing sites were comparatively small, with an average of 54 houses in each apartment.

Figure 2 shows the number of temporary housing units and their locations. The Chūetsu Earthquake did not cause concentrated damage within a single area; it inflicted severe damage that was interspersed throughout each community. Where possible, temporary houses were provided in a way that, responded to the demands of victims, and scattered small-scale temporary housing apartments were constructed across the entire disaster area.

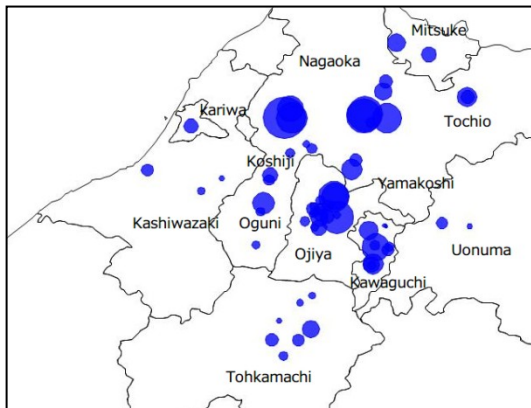


Figure 2. Sites location: Chuetsu

Table 3. Units within 2km of the offices

city	0-2	total	0-2 %
Nagaoka	459	840	55%
Mitsuke	61	103	59%
Ojiya	590	870	68%
Koshiji	29	114	25%
Kawaguchi	267	412	65%
Tohkamachi	42	138	30%
Kashiwazaki	27	44	61%
Others	0	939	0%
	1,475	3,460	43%

The Analysis of the land use categories for temporary housing sites reveals the following characteristics of temporary housing sites: (1) School grounds were used as temporary housing sites as there were limited permanent vacant public spaces, such as parks and sports facilities (outdoor grounds); (2) Public land was available to certain extent; however, primarily on a temporary basis; (3) Despite the availability of public land, instead of constructing large-scale apartments, municipalities actively sought to build small-scale apartments on private land.

Table 3 shows the locations of temporary housing apartments within 2 km of the government offices of the municipalities in which they were located. Here we can see that in Ojiya city and Kawaguchi town, temporary housing was provided within relatively close proximity of urban centers.

The problem experienced by municipalities when selecting sites for temporary housing after the Chūetsu Earthquake was that, ultimately, they were forced to use spaces such as school grounds because redundant spaces—such as development sites and national and prefectural land—were not at their disposal. Although sufficient space was available, the lack of municipally owned space prior to the earthquake posed problems owing to limitations on amount of space that can be prepared in advance. To solve these problems, instead of preparing spaces in advance, municipalities must consider strategies for expanding the amount of space available during disasters. Unlike urban centers, where absolute space is limited, adequate space is available when private land is taken into consideration. It is important for municipal governments to prepare for disasters by compiling lists of available spaces and considering methods for expanding the lists themselves.

### **Consideration for the Great East Japan Earthquake Disaster Case**

The Great East Japan Earthquake Disaster case has the following characteristics about the temporary housing provision in comparison with 2 cases: 1) It was almost impossible to provide temporary housing sites in the tsunami inundated area. 2) Some municipalities had been devastated by the tsunami, 3) Private housings in the other area were used as public temporary housings. As result of which, the number of building temporary housing units is smaller than that

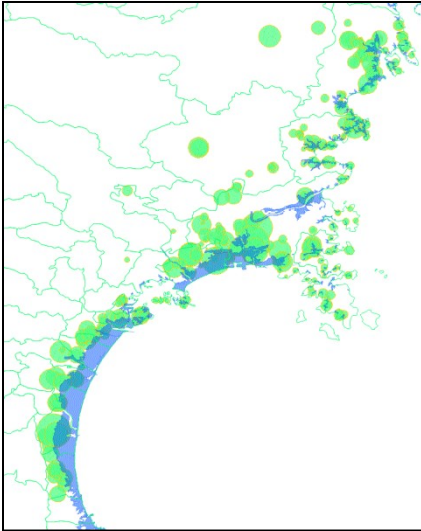


Figure 3. Sites location: Miyagi  
Great East Japan

of the Great Hanshin-Awaji Earthquake based on the housing loss. It is probably that this influence will appear the increase of the population of the devastated area and at the same time it shows that it will be difficult to build the community and town function again.

Table 4. Comparison of Hyogo, Hanshin-Awaji

human loss	dead	missing	injured
Miyagi	10,472	1,283	4,145
Hyogo	6,402	3	40,092
hosing loss	100% damaged	50% damaged	partly damaged
Miyagi	82,911	155,086	222,829
Hyogo	104,004	136,952	297,811
Temporary Housing	sites	units	
Miyagi	406	22,095	
Hyogo	627	47,228	

### **Conclusions**

The temporary housing provision will prescribe the final feature of the recovery area. It is related to the recovery speed of sufferers and damaged areas in the viewpoint of the location of housing sites. Specially, the efficient allocation of the temporary housing will decide to success the recovery or not. It is better to provide temporary housings near the municipality hall. On the other hand, temporary housing provision points and sites are constrained by the previous land use of the area. It is important to manage public spaces to use something for disaster response in the pre-disaster time to adapt the post-disaster society.

### **References**

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