Abstract
The purpose of this study is to reveal the residential environment of temporary housing for disaster victims and propose supporting measures, taking a practical approach to temporary housing for victims of two disasters, the 7.13 flood and the Chuetsu earthquake, both of which occurred in 2004 in Chuetsu, the middle area of Niigata Prefecture in Japan. By means of on-site investigation and a "temporary open café" project providing practical support for residents in temporary housing, this study arrived at the following conclusions.

(1) Knowledge of how to improve temporary residential units was shared with neighbors, but it was not spread among the temporary sites. (2) The communities in temporary housing were based on former neighborhood communities. It was useful that people who used to be neighbors were housed at the same temporary site and a common room was built at each temporary site. (3) The community in temporary housing was exclusive. However, in the second stage of recovery, the temporary cafés became useful as places where residents could escape the bonds of these communities. (4) During the one and half years after the earthquake, special places providing opportunities for communication and refreshment were produced by residents in the temporary sites.

Keywords: temporary housing for disasters; residential environments; practical study; self-improvement of residential units

1. Introduction
1.1 Background
In 2004, the Chuetsu region in the middle area of Niigata Prefecture in Japan was struck by two disasters, namely, the 7.13 flood and the Chuetsu earthquake (Table 1.). These two disasters destroyed or partially destroyed 126,000 houses. Consequently, 71 temporary sites were developed and 3,860 temporary residential units were built on these sites (Fig.1.).

The temporary housing was intended to be in place for only two years\(^1\). During this period, the victims underwent an important environmental transition while recovering from the mental and physical damage caused by the disasters. It is important to manage such a residential environment properly so that suitable conditions for recovery can be provided.

However, temporary housing does not meet the needs of victims perfectly, because it is designed to provide the bare minimum of residential space quickly in any place struck by unexpected disaster.
Therefore, in order to build an efficient residential environment for recovery, it is important that residents improve their temporary residential setting themselves.

1.2 Purpose

The purpose of this study is as follows.

(1) To propose supporting measures for residents in temporary housing using a practical approach involving a "temporary open café" project.

(2) To examine the nature of a residential environment consisting of temporary housing from the following three aspects:
   a) Self-improvement of temporary housing by residents
   b) Community building by residents within the temporary housing sites
   c) Other forms of progress in the residential environments over one and a half years

1.3 Past Studies

In a previous study of temporary housing, Maki (1995) studied the actual physical condition of the housing and pointed out that problems existed stemming from outdated regulations, and stressed the importance of temporary housing being considered as part of the reconstruction process after a natural disaster. Regarding the quality of life in temporary housing, Miura (1996) studied personalization in residential space from the perspective of critical environmental transition and revealed the important role of commitment to a temporary residential space by residents in transition. These studies pointed out the importance of the residential environment in the process of recovering from mental and physical damage. In order to manage such a residential environment properly, so that suitable conditions for recovery can be provided, this study focuses on self-improvement of the space carried out by the residents themselves. This is an original contribution of this study.

2. Method

This study employed the following two research methods:

(1) Onsite investigations at 44 temporary sites: In 2005, 44 temporary sites (each consisting of more than 20 temporary residential units) were examined for self-improvements, as detailed below.
   a) Exterior elements attached to the facades of the residential units
   b) Self-improvement in wind-breaking porches

(2) Approach to using the temporary open cafés: The temporary open cafés were established at six sites in order to provide practical support for the residents. In addition to acting as a refreshment space with tea service, the cafés were also a useful place to conduct interviews with residents, and provided an information and communication space in which useful information for residents was circulated.

Nine open cafés were established at six temporary sites in 2005, and seven times at the temporary site Yokodai in 2006. The following information was provided in the information space.

a) In 2005, details about how to improve the temporary units
b) In 2006, special spaces funded and developed by residents of the temporary sites

3. Overview of Temporary Housing in Chuetsu

The temporary housing consisted of residential units in linear figures. There were three types of units (1K, 2DK, and 3DK), all with separate toilets and bathrooms (Fig. 2). Depending on the number of family members, refugees are generally provided with this type of residential unit.

4. Self-Improvement of Temporary Residential Unit by Residents

In order for an overview of the residential environment of the temporary housing to be established, 44 temporary sites (each consisting of more than 20 temporary residential units) were examined for factors of self-improvement (Fig. 3).
4.1 Exterior Elements Attached to the Facades of Temporary Residential Units

Temporary residential units were covered with exterior elements such as plants, sunshades, screens, and storage facilities. The activities involved in establishing such improvements were carried out by the residents themselves (Fig.4.). The temporary sites differed according to the amount of surface area covered with exterior elements (Fig.5.). At three particular temporary sites, the amount of surface covered was over 40%. At another site, less than 10% was covered.

Fig.4. Exterior Elements

![Fig.4. Exterior Elements](image)

4.2 Wind-Breaking Porches

A wind-breaking porch is a space established at the front of an entrance to prevent wind and snow from entering during the winter. This is a popular facility in cold areas of Japan such as Chuetsu, and every temporary residential unit in Chuetsu had one (Fig.6.). However, many of these wind-breaking porches proved unsuitable for the weather conditions of the Chuetsu area. As a result, they were improved by the residents (Fig.7.).

In the course of this survey, it was found that 58% of temporary residential units had wind-breaking porches that were improved by residents. However, less than 20% were improved at five other temporary sites (Fig.8.). Thus, differences among temporary sites were found in terms of number of self-improved wind-breaking porches, as well as the added exterior elements.

Fig.5. Histogram of Ratio of Exterior Elements

![Fig.5. Histogram of Ratio of Exterior Elements](image)

Fig.6. Wind-Breaking Porch

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In the course of this survey, it was found that 58% of temporary residential units had wind-breaking porches that were improved by residents. At nine temporary sites, more than 80% of the wind-breaking porches were improved by residents. However, less than 20% were improved at five other temporary sites (Fig.8.). Thus, differences among temporary sites were found in terms of number of self-improved wind-breaking porches, as well as the added exterior elements.

Fig.7. Self-Improvement of Wind-Breaking Porches

![Fig.7. Self-Improvement of Wind-Breaking Porches](image)

Fig.8. Histogram of Ratio of Self-Improvement of Wind-Breaking Porches

![Fig.8. Histogram of Ratio of Self-Improvement of Wind-Breaking Porches](image)

In every case of improvement, a front panel had been attached to the side panel that had been set up when the temporary units were initially provided. Some panels had sliding doors and others had swing doors. This survey classifies the wind-breaking porches into nine types according to the configuration of the front panel attached by residents, as shown in Fig.9.

Fig.9. Nine Types of Front Panel Attached by Residents

![Fig.9. Nine Types of Front Panel Attached by Residents](image)

The distribution of the nine types of porch in the three sites that were located nearby was analyzed (Fig.10.). In every group of three temporary sites, the major type of porch used was different. Thus, a clear relationship between the temporary sites was not found.
in terms of the improvements being carried out there by the residents.

4.3 Knowledge of Self-Improvement

According to interviews with the residents, many people made improvements similar to those of their neighbors. This suggests that neighbors shared their knowledge of how to make improvements. However, as shown in 4.1 and 4.2, this knowledge tended to be shared only within small areas and had not spread widely to other temporary sites.

5. Practical Support

For the purposes of this study, a "temporary open café" project was conducted to provide practical support to residents of temporary housing (Fig.11.). The primary aim of this was to provide a space where refreshments could be served and informal interviews could be conducted. Second, bearing in mind the conclusions of a previous survey showing that the knowledge of how to make improvements was spread only within closed areas by neighbors, the purpose of this project was to circulate this knowledge around all the temporary sites by facilitating communication in the "information space" of the temporary open café.

The temporary open cafés were set up nine times at six temporary sites, between which conditions of self-improvement differed. The cafés consisted of a series of small tents with stackable boxes that were used for chairs and tables. All necessary materials were delivered by car, so that the process could be independent of the sites' established infrastructure and facilities.

The cafés were set up in open spaces and were open to residents from any of the temporary sites. Free coffee and tea were served, and residents could chat with each other. Some informal interviews were also carried out.

In addition to the tea and coffee service, the cafés provided an information space in which information about how to improve the temporary units was displayed. New information offered by various residents was added in successive cafés. The information space delivered much knowledge necessary for self-improvement to other temporary sites. This free exchange of information enabled all residents to gain practical knowledge, and this knowledge gradually spread to other temporary sites (Fig.12.). In the process of the exchange, it was important for the coordinator to omit illegal or misleading information about self-improvements.

6. Establishing Communities

Details of the condition of the communities in temporary housing were revealed by interviewing the residents.

After the 1995 Hanshin–Awaji earthquake, some residents were isolated from temporary housing communities. There were 120 cases of "solitary death" where the residents had died alone in their units and were only found a few days later.
In order to avoid similar isolation at these temporary sites, the following two countermeasures were conducted after the Chuetsu earthquake:

(1) People who lived in the same neighborhood before the earthquake were housed in the same temporary site in order to maintain existing human networks.

(2) A common room was built at each temporary site, consisting of more than 50 temporary residential units.

According to interviews with residents, the communities formed at the temporary sites were based on the former neighborhoods and the common rooms that the residents were attached to. The countermeasures were effective. In the case of the Chuetsu earthquake, there were no solitary deaths for three years.

On the down side, because residents lived in small temporary sites that were separate from other "regional areas," there was a tendency for communities to become too tight and exclusive. Some residents felt that this became oppressive. While it is crucial to maintain communication among residents in the primary stage of a disaster, at the next stage it is also important to provide a place where residents can escape the bonds of the temporary housing community.

The space offered by temporary open cafés was separate from the existing communities because the cafés were delivered from outside individual temporary sites. The provision of the temporary open cafés was a particularly effective measure for helping those in temporary housing during the second stage of recovery.

7. Progress in Residential Environments

In order to measure the progress made in the residential environments in temporary housing, interviews were conducted with the residents after one and a half years of the Chuetsu earthquake.

7.1 Special Spaces in Temporary Sites

The interviews revealed that many residents had "special places" in their temporary sites, which included the following (Fig.13.):

- Small "farm" in a vacant space in a residential unit
- Bench space on a street corner
- Quiet space separated from the temporary site
- Viewpoint with beautiful scenery
- Place with a favorite dog
- Friends' units open to other residents
- Unique improved units

Every special place was found or developed by residents. Further, the residents could benefit from the opportunity for communication and refreshment. The special places played an important role in the daily life of residents.

7.2 Practical Support

In 2006, the temporary open café was held seven times at a temporary site — Yokodai — providing an information space about the special places (Fig.14.).

In the information space, a large model of the Yokodai temporary site was displayed, on which the locations of the special places were indicated using small flags (Fig.15.). Residents could add new information about particular special places. Through the free exchange of information, knowledge of the special places could then be shared among the residents.

8. Conclusions

This study reached the following conclusions:

(1) The knowledge to improve the temporary residential units was initially shared only with neighbors and was not spread across the temporary sites.

(2) The "temporary open café" project conducted for this study provided practical support to residents of temporary housing and enabled useful information
to be shared between all the temporary sites. Informal interviews were also conducted at the cafés.

(3) The communities in the temporary housing were based on former neighborhood communities. This was efficient, because people who used to be neighbors were housed at the same temporary site. A common room was built at each temporary site.

(4) The communities in the temporary housing were initially quite separate and exclusive. However, during the second stage of recovery, the temporary open cafés became useful for providing a space in which residents could escape the bonds of their immediate temporary communities.

(5) Over the one and half years after the earthquake, special places providing opportunities for communication and refreshment in the temporary sites were produced by residents. Those who attended the temporary open cafés tried to share information about these special places with other residents.

In this study, it is confirmed that commitment to a residential environment by its residents, such as, for example, self-improvement and the identification of "special places," are important factors in the process of recovering from the mental and physical damage caused by disasters.

Through the practical approach used in the temporary open café project, it is found that fostering commitment to the temporary residential environment by residents was needed to maximize the effectiveness of temporary housing. It is expected that programs to foster commitment to residential environment should be included in the support process for temporary housing for disaster victims.

Note

1) The term of the temporary housing was extended for one year on October 1, 2006.

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