

## From emergency shelter towards disaster-relief housing – Tōhoku’s reconstruction case study

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**Abstract:** This paper presents the post-disaster reconstruction of the Tōhoku region. Although Japan has always been one of the most prepared countries because of its long history with natural disasters, the 2011 Great East Japanese Earthquake and tsunami might be one of the most significant disasters recorded in the country’s modern history. This unprecedented disaster that has shaken Japan is a decisive turning point for the entire society as well as for architects and urban planners. Almost ten years later, reconstruction work is still ongoing. This paper introduces specifically Japanese architects’ involvement during the three phases of recovery: emergency shelter, temporary accommodation and permanent housing. After the first stage of perplexity and doubt, architects gradually stepped up and started initiatives to resolve the disaster victims’ precarious situation. This article outlines some of the architects’ actions through the three phases of recovery since the 3.11 disaster. Each of these temporalities has its issues and challenges which the urban planners, architects and designers tried to solve using their know-how to help rebuild devastated communities.

**Keywords:** Earthquake, Japan, Reconstruction, Planning, Housing

### 1. Introduction

On the 11<sup>th</sup> of March 2011, an unprecedented earthquake of 9.0 magnitude rocked Japan, from north to south. A few minutes later, a series of tsunami waves fell down the Tōhoku coast, devastating over 500 square kilometers, mainly in Miyagi, Iwate and Fukushima prefectures. The incident in the Fukushima Daiichi power plant reactors forced the evacuation of the nearby population outside of the radiation-affected area.

This triple disaster caused severe casualties: 16,000 victims, 3,000 missing people, 330,000 homes devastated and nearly 550,000 refugees [1]. Also referred to as “The 2011 Great East Japan Earthquake and Tsunami,” it is a decisive turning point for the entire Japanese society as well as for architects and urban planners.

After a disaster, the priority is sheltering people during the three phases of recovery: emergency shelter, temporary accommodation, and permanent housing. Even though Japan has an increasing frequency and impact of natural disasters, architects have not played a significant role in post-disaster recovery before the Great East Japan Earthquake.

Nonetheless, the major crisis that arose in the aftermath of this disaster inspired the architects' commitment to take part in the reconstruction [2], [3]. Following March 2011, some Japanese architects were indeed involved in each of these phases, applying their design skills to help with rebuilding devastated communities.

This paper aims to analyse these architects' actions in reaction to the disaster and the role they played in Tohoku's revival. They had especially a leading role regarding the rehabilitation of housings including some innovative ideas, such as a partitions system in the shelters, new temporary accommodation or community-friendly disaster-relief housing.

## 2. Emergency shelter

Due to Japan's history of natural disasters, the government has developed evacuation shelters and temporary housing to provide better health and safety conditions for Japan's affected communities. After the 2011 disaster, victims could find clean water for drinking, washing, and a sewage system in these evacuation shelters.

Nevertheless, these facilities are generally wide open spaces like school gymnasiums, lacking privacy for the victims who stay there for months waiting for relocation to temporary housing (Fig. 1). The priority in this phase is to provide privacy to improve the comfort of the refugees.



Fig. 1. Emergency shelter without partitioning. *Source:* [4]



Fig. 2. Emergency shelter with partitioning. *Source:* [4]

In response to this issue, Shigeru Ban has been working on a partition system using paper tubes and clothes since the early 2000s. This system, called "Paper Partition System" is light, flexible, and does not need any fixation, making it easy to assemble and disassemble.

The 1995 earthquake in Kobe was a triggering event for Shigeru Ban to get involved in humanitarian causes. He created the "Voluntary Architect Network," a Non-Governmental Organization, to help him in his task. With this network of volunteers (students and architects), he travelled worldwide after natural (or human) disasters to build shelters for refugees made of cardboard tubes [5].

In total, between April and July 2011, more than 1,800 “Paper Partition” units were sent and installed in Tōhoku in the different prefectures affected by the disaster (Fig. 2). The architect went on-site with the Voluntary Architects Network group to supervise and help with the structure’s installation [6].

However, Shigeru Ban also pointed out that some of the shelters were reluctant towards the partition system: “[...] some of the shelters’ management did not want us to do it, because they said that it is going to make it harder to control the victims” [7].

### 3. Temporary accommodation

#### 3.1. *Kasetsu jūtaku*

After a few months of living in the emergency shelter, refugees are progressively relocated to temporary accommodation called *kasetsu jūtaku* 仮設住宅. The government is financing these accommodations through a special “in case of disaster fund” and then hires private developers for construction. Nearly 52,000 temporary accommodations were built after the 2011 disaster: 22,000 in the Miyagi prefecture, 14,000 in the Iwate prefecture and 16,000 in the Fukushima prefecture [8].

These prefabricated units are narrow and unfit for harsh weather [9]. The entire family sometimes has to live in only 30 square meters, putting refugees at risk of falling into dangerous social withdrawal and depression [10]–[12]. In order to solve these precarious living conditions, some architects have been trying to improve the temporary housing system by proposing new models.

During the installation of his “Paper Partition System” at the emergency shelters, Shigeru Ban met the mayor of Onagawa who explained his small municipality’s difficulties in finding suitable lands to build temporary housing.

The government policies regarding *kasetsu jūtaku* 仮設住宅 require many hectares of flat land beyond the reach of tsunamis waves. Nevertheless, the municipality situated on the hillside lacks considerably viable land to accommodate these dwellings. Ban proposes to use the baseball stadium to build a project of temporary housing using old shipping containers, piled up on three levels. This system allows fast execution, has excellent resistance to earthquakes and reduces construction costs. Furthermore, stacking frees up some ground to offer community spaces.

This reinvention of the traditional temporary housing system did, however, have some difficulties at the outset. The architect explains that even if the building met seismic prevention standards, the system being a first, permits had been challenging to obtain. Another requirement was to be able to benefit from the budgetary aid of the prefecture. The rooms’ size thus respects the imposed standards but improves the interior space (in particular storage) thanks to the donations collected by the association.

Ban continues his commitment to helping disaster victims in Onagawa. Together with VAN, he organized a survey in the temporary settlements to inquire about the positive and negative aspects of the current temporary housing. The purpose was to hear the opinion of the occupants in order to improve the quality of life.

In total, VAN visited more than 30 complexes in Onagawa and carried out nearly 400 interviews in order to improve the current system for the *kasetsu jūtaku* 仮設住宅. Ban’s work in

Onagawa's city was not limited to temporary architecture. The mayor asked him to build the new train station in 2015, which became a crucial element in the city centre revival [13], [14].

### 3.2. “Home-for-All”

Scattered communities and cramped living conditions do not enhance social cohesion in temporary housing complexes. In response to this issue, Toyo Ito and his colleagues of Kysin-no-Kai have created the concept of friendly places where the inhabitants could meet and share convivial moments [15]. That is the origin of the “Home-for-All” project (*みんなの家 Minna no ie*), with the installation of community spaces in the *kasetsu jūtaku* settlements after the disaster of 2011, which later expanded to various contexts [16].



Fig. 3. Sendai “Home-for-all”. Source: [17]

The first “Home-for-all” was built in Sendai with the financial support of *Kumamoto Artpolis* (Fig.3). For this attempt to create a community space, Itō points out the challenge of designing a public building for “all” in its most primitive form [18].

Thus, after lengthy discussions with the residents, the design was oriented towards a “typical house”: a large double-pitched roof, an outdoor veranda, a wood stove... Plenty of other “Homes-for-all” were built later on the architects’ initiative, using private funding or patronage of various Japanese and foreign companies.

Nevertheless, the most emblematic one is Rikuzentakata’s Home-for-All, which granted Toyo Itō his fame and popularity. This small town in the Iwate prefecture, also the birthplace of the photographer (and friend of Itō) Naoya Hatakeyama, was entirely devastated by the tsunami. Toyo Itō chose this meaningful location to set up an innovative project which he wanted to showcase at the Venice Biennale. The aim was to raise international awareness of natural disasters and their repercussions and solicit support for further Home-for-All projects.

The architect summoned three young architects to work with him on the design: Kumiko Inui, Akihisa Hirata, and Sou Fujimoto. Together, they frequently visited the site to talk with

the residents and listen to their wishes for this community space. Their encounter with Mrs. Sugawara, a fervent actress in the community of Rikuzentakata, was a decisive asset to fulfil their project.

Rikuzentakata's Home-for-All was exhibited at the 13<sup>th</sup> Venice Biennale entitled "Architecture, possible here?" [16]. Hatakeyama's large pictures from the site before and after revealed the devastation, while at the same time, models, sketches, and interviews describe the process and progress of the ongoing project.

This exhibition mixing architecture and photography raised the spectator's awareness about the 2011 disaster and its aftermaths. It conquered the biennale's jury, which granted the highest award, the Golden Lion, to Itō and his acolytes. This award also gave international media coverage to the project, encouraging the development of Homes-for-All across Japan.

Toyo Itō continues to build "Homes-for-All" across Tohoku with the help of young architects, and later in Kumamoto (after the 2016 earthquake) [18]. For him: "Devastated areas where everything is lost is the ideal opportunity to take a new look at what the architect really stands for. 'Home-for-All' may consist of small buildings, but raises the essential question of what form architecture should take in the modern age and beyond" [16].

## 4. Reconstruction

Once the emergency and temporary accommodation phases are over, the question of building for the long term appears. [19]–[21] How can architects participate in this process generally dominated by civil engineering?

### 4.1. *ArchiAid*

Architects, academics, and students from the Tōhoku region founded *ArchiAid* to help the disaster-stricken areas. The group aims to support reconstruction actions through a network of volunteer architects and avoid isolated activities in this vast and scattered affected area of the Sanriku coast<sup>1</sup>. To this end, their objectives are:

1. Create an international network to support reconstruction projects.
2. Encourage education by bringing together professionals, students, and inhabitants.
3. Gather and promote information about the disaster.

The network has been overseeing numerous initiatives in these three domains since 2011, whether by organizing exhibitions, workshops, or supervising reconstruction projects [22]. It has made a long-term commitment to the region and has been particularly active in Ishinomaki city or in the more remote parts of the Oshika and Onagawa peninsula.

*ArchiAid* teams were sent on-site to work with local communities in round-table discussions and workshops to tailor specific proposals to each locality. By means of researches and workshops, the members were able to understand the will of the inhabitants and carefully propose individualized reconstruction [23].

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<sup>1</sup> The Sanriku Coast (三陸海岸, *sanriku kaigan*) is a coastal region on the Pacific Ocean, extending from southern Aomori Prefecture through Iwate Prefecture and northern Miyagi Prefecture in Tōhoku (northeastern side of Japan main island of Honshu). Its rocky shoreline is made out of cliffs, sharp rocks, and sandy beaches.

## 4.2. Living access type

After the Kobe earthquake in 1995, studies have shown the emergence of various social problems among victims after their unfitted relocation [24]. Many cases of unemployment, alcoholism, and solitary death (孤独死 *kodokushi*) are recorded in these public housing units, where the apartments usually follow the most common North-South typology (Fig. 4).

Recent studies have shown that to reduce the risks associated with loneliness, it is necessary to provide meeting spaces in these buildings [25]. Promoting community relationships between neighbours would help to reduce the risk of depression and its derivatives among refugees.

In this context, Yasuaki Onoda—architect-urbanist and founder member of the *ArchiAid* group—proposed an adaptation of the living access type developed in several reconstruction projects carried out in Tōhoku. The Urban Renaissance Agency UR (UR都市機構 / *UR toshi kikō*), a semi-public independent administrative institution in charge of the Japanese public housings, started using it in the 1980s [26]. This plan reverses the classic North-South layout, in line with three morphological principles:

1. Place the alleyway to the south.
2. Adjoin the living room so that it also faces south.
3. Install the bedroom to the north to ensure privacy.

Following these principles, the plan designed by Onoda offers a south-facing public area, supporting exchanges between neighbours, with the entrance of the housing (Fig. 4). The living room is located on this facade to maintain links with the outside, while spaces requiring more privacy are set back on the north side [27].

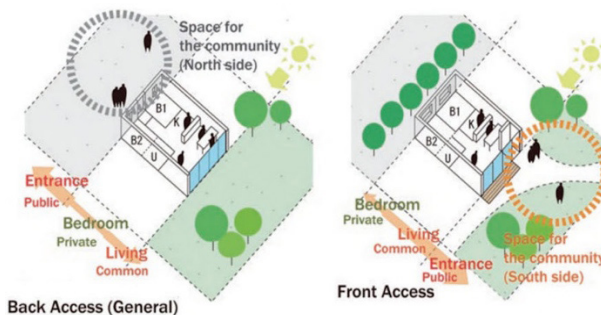


Fig. 4. Living/front access plan: a schema for community-friendly housing *Source*: [27]

Therefore, some architects, urban planners and landscapers became involved as advisers in public housing reconstruction projects. Their leading role has been to guide the disaster-affected municipalities in the construction of *fukko jūtaku* 復興住宅 (reconstructed housing) in order to offer a good quality of life to the inhabitants [27].

In the wake of Japan's experience of the 2011 disaster, inhabitants' solidarity has risen [28], [29], leading to a "living together" movement that has also impacted housing. Furthermore, some *fukko jūtaku* projects offer new typologies combining the characteristics of the individual house with those of collective housing [25].

## 5. Study case: Iwanuma's successful relocation plan

The author visited several disaster-relief housing neighbourhoods in the Miyagi prefecture in September 2018 to make photographic documentation and observations from the most direct sources. Among these projects, we selected Iwanuma's for further urban and architectural analysis.

Iwanuma (岩沼市) and its 40,000 inhabitants, is located in the Miyagi Prefecture, south of Sendai Airport. During the 2011 disaster, the tsunami waves reached further inland, drowning nearly half of the city's area. The city suffered considerable damages (human and material): nearly 180 victims and more than 1,200 houses ruined by the water. The seashore and its fishing villages were entirely destroyed.

Nevertheless, the Japanese government policies for reconstruction prohibit construction in these areas, considered now as a "disaster-risk area." There is an urgent need to solve the problem of these communities' relocation.

In July 2012, the City Council officially launched the project by acquiring land west of the Tamaura district. After receiving all the necessary authorizations from institutions, the City Council transmitted the decision-making powers to the residents. Thus, the city of Iwanuma wished to promote a participatory process in which citizens develop the project, guided by professionals.

As the relocation project involved six villages, it was decided that each of them would have three representative members on the Council for Urban Planning. For more balance, each village had to recommend an elder, a woman, and a young person among its representatives.

A team of 18 inhabitants was thus invited to work along with three professionals (a landscape designer, an urban planner and a housing policy specialist<sup>2</sup>) who guided them through the various stages of drafting the master plan. The Council met nearly 28 times between June 2012 and December 2013 to discuss various aspects of the project.

The Council members wanted to maintain the community ties that are important in these villages, mainly composed of elderlies. The Council's priority number one was to ensure that people from the same locality are relocated to the same neighbourhood area.

Avoiding group members' dispersal prevents isolation and social withdrawal, which is a particularly high risk for refugees [10]. The Tamaura-nishi district (Fig. 5) has been divided into six zones, one for each village, mixing private and collective housing.



Fig. 5. Example of *Fukko Jūtaku* built in 2015 in Tamaura-nishi, Iwanuma City (Tōhoku) *Source*: own study

<sup>2</sup> Mikiko Ishikawa for landscape, Yasuaki Onoda for urban planning and Yoshihide Sanbe for housing policies.

The three public housing projects located in the contact zones are intended for residents of the two adjoining villages. The concept is to combine two villages to form a “cluster” including a park and a meeting place (集会所 *shūkaisho*). These two community’s spaces welcome the residents’ events: “Public housing for the people of the village would be distributed among these clusters, with each site connected to each cluster as part of a community” [27].

The inhabitants chose the architects for the public housing projects through a proposal competition and a public presentation. These three disaster-relief housing projects (災害公営住宅 *saigai kōei jūtaku*) built in Iwanuma have then become references, regarding the short delay of construction, but also the quality of the dwellings, which are one of the first attempts to apply the concept of the “living access plan.”



Fig. 6. Example of housing following the living access type, *Source: own study*

The example presented in Figure 6 was designed by the Urban Architectural Planning Partnership (UAPP) and included 44 detached houses built of wood. The architects created the dwellings using a pattern that divides the space into four zones. The bathroom and kitchen are combined on a quarter and located in the northern part, leaving the rest for the living spaces to the south, which open onto a shared outdoor terrace connecting to the central “Green Road.”

This “Green Road,” accessed via gently sloping ramps, facilitate access for persons with reduced mobility. These easy-access pedestrian paths lead through the entire neighbourhood to the community’s cluster (park + meeting place).

Each green space has a singular characteristic. For instance, the western park is called “*Igune Parc*” (in reference to a specific Tōhoku tree) and is mainly dedicated to relaxation and contemplation of nature. The “*Bōsai Park*” (*bōsai* means risk prevention), due to its central location, has a role in strengthening disaster prevention. On the east side, the “*Kodomo Parc*” offers a playground for the youngest ones (*kodomo* means children). These three parks are connected by a green promenade that spans the district from west to east, enhancing soft mobility.



In the eastern part of the district, a spacious park is located with a water tank behind the commercial area. This park symbolizes the newly-built neighbourhood and was designed to host community events and festivals such as the *Hanami*<sup>3</sup> or other local celebrations.

## 6. Conclusion

This paper outlined various types of actions taken by architects during the three recovery phases of Tōhoku. The concepts that have emerged will undoubtedly influence the way we think about and design housing from now on.

The importance of including meeting places to encourage residents' community was admitted after the failures of 1995. Preventing the social withdrawal of refugees has thus become a priority in these social housings, which systematically offer community spaces like parks, "meeting spaces" (集会所 *shūkaisho*), or "Homes-for-All" (みんなの家 *Minna no ie*). Implementing new morphology in these dwellings, promoting south-facing spaces, and facilitating meetings between neighbours, are different proposals made by the architects in response to this issue.

However, the theory envisioned by the designers can sometimes differ from its actual application on-site, as the needs of the inhabitants may be different from what the architects had thought in their initial concept. Even though the community networks have been proven to be essential in the recovery process, building a community from scratch seems a complicated task.

In fact, in the increasingly individualistic Japanese society where local communities are disappearing and where neighbours do not know each other, may not be the most favourable conditions for the emergence of a "community spirit."

On the contrary, Iwanuma's relocation project can be said to be successful because it has achieved the protection of the already existing community. By simply avoiding the residents' scattering during the relocation process, the city has managed to keep tight the ties of the community instead of struggling to create a new one.

On the other hand, even if these first attempts to create community-friendly housing are not a resounding success yet, they nevertheless demonstrate the architects' commitment to improving refugees' lives. Since 1995, much effort has been put into improving disaster-relief housing in Japan, especially regarding the social aspect. The improvement of disaster-relief housing is always an ongoing process, and there will be further enhancements in the future, learning from past mistakes.

## 7. Acknowledgement

The research was carried out as part of our doctoral research at the Kyoto Institute of Technology and financed by the Japanese Ministry of Education, Culture, Sports, Science, and Technology through the Monbukagakusho program.

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<sup>3</sup> *Hanami* 花見 literally, "looking at the flowers" is a traditional Japanese custom of appreciating the beauty of flowers, mainly cherry blossoms (*sakura*), when, from late March to early April, they are in full bloom.

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