Akiyoshi NII 1

1Member of JSCE, Associate Professor, Dept. of Civil Engineering and Urban Design, Kokushikan University
(Setagaya 4-28-1, Setagaya-ku, Tokyo 154-8515, Japan)
E-mail: nii@kokushikan.ac.jp

This essay is an account from the perspective of a supporting civil engineer and landscape expert on the reconstruction of the Kirikiri district of Otsuchi Town in the Kamihei County of Iwate Prefecture, which was severely damaged by the devastating tsunami triggered by the Great East Japan Earthquake. It also reports and on the process and challenges of the town reconstruction planning and spatial design. One defining characteristic of the process in Otsuchi Town is that the local residents were involved from the conceptualization to the specific planning and design of the reconstruction. This urban renewal method, which can also be called a local residents collaboration style, plays an important role in deciding the spatial design of the whole district and in the negotiations with relevant organizations on the national highway and changing the linear shape of the seawalls. The timeline from after the disaster up to fiscal year 2015 divided into four stages in terms of progress in the town reconstruction planning: 1) decisions on the reconstruction plan objectives and collective housing scope; 2) decisions on the structure of the district; 3) decisions on the spatial image of the reconstruction planning; and 4) a detailed study of the public spaces and facilities. I aim to describe the process of the spatial design in each stage and the resulting relationships while at the same time show a spatial design that could contribute to urban renewal that may be necessary in the future by describing challenges that arose in the process.

Key Words: the Great East Japan Earthquake, reconstruction planning, machidukuri, spatial design, Otsuchi town

1. INTRODUCTION

This paper is a report on the reconstruction of the Kirikiri district of Otsuchi Town in the Kamihei County of Iwate Prefecture, which was severely damaged by the devastating tsunami triggered by the Great East Japan Earthquake on March 11th, 2011. It also details and summarizes the spatial design from the time of the disaster to fiscal year 2015.

From June 2011, the author participated as an external technical adviser in the joint project between Token C. E. E. Consultants Co., Ltd. and U-Planning Co., Inc., the contractors for the City and Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism’s Examination of Urban Reconstruction Patterns project (subject site: Otsuchi Town). From October of the same year, the author became involved in the Otsuchi basic reconstruction plan as a coordinator of the Local Reconstruction Council for the Kirikiri and Namita districts. On an ongoing basis since then, activities have included several instances of coordination and giving advice on the reconstruction plans for both districts, offering technical support towards the realization of the town’s reconstruction planning.

To date, as regards Otsuchi’s reconstruction planning, we have the reports from Nakai, the key person in the supporting experts’ group, which summarize the process and characteristics of the overall

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To date, as regards Otsuchi’s reconstruction planning, we have the reports from Nakai, the key person in the supporting experts’ group, which summarize the process and characteristics of the overall
Otsuchi Town spatial design from the time of the disaster to fiscal year 2013. Therefore, this essay will condense the overall process as much as possible and focus on describing the Kirikiri district. Further, concerning Otsuchi’s reconstruction planning, we have the practical report by Osaki et al. on the creation of a public square making use of open-air stalls directly after the disaster\(^4\), and Fukushima and Nakai’s report on local community workshops in the Machikata district\(^5\) and reflections on the plan.

2. OVERVIEW OF THE KIRIKIRI DISTRICT AND CHARACTERISTICS OF THE TSUNAMI DAMAGE

(1) Outline of the Kirikiri district

Kirikiri is one of five main districts along the coastline of Otsuchi Town and is known as a settlement with scenic views of Funakoshi Bay over beautiful white sand beaches.

This district was the main Kirikiri Village with the present Akahama and Namiita districts as branch villages before the large-scale mergers of the Meiji era, and it merged with Otsuchi Village and Kozuchi Village to form Otsuchi Town in 1889. The Kirikiri district, which was home to wealthy merchants who had served under the government patronage of the Morioka domain, and in particular was the home of Maekawa Zenbei, aka Kirikiri Zenbei, a fishing nets and vessels owner, has developed as a fishing settlement; whereas the Machikata district, which functions as the administrative center of the town, was the Otsuchi clan castle town and magistrate’s office of the Morioka domain from long ago.

This district was catapulted into fame with the novel ‘Kirikirijin’\(^6\) written by Hisashi Inoue, a prominent novelist and scriptwriter in Japan. This is the fictional story of a small village in the Tohoku region, Kirikiri Village, which becomes independent from Japan. However, in addition to the various efforts in the reconstruction plans after the 1933 Sanriku Tsunami mentioned later, and the setting up of the emergency management headquarters by the locals after this tsunami, as well as the work to free the roads of obstacles and the building of an emergency heliport, and according to the author’s own experiences working closely with the local people through reconstruction projects, the Kirikiri district is an attractive area with its people very much like those portrayed in Inoue Hisashi’s book with their strong spirit of self-help and tightly bonded community with high self-governance skills.

(2) Transition of the settlement location and tsunami damage after the Meiji era

Most of the district is located spread out over the skirts of the mountains in the northwest, and other than a low-lying area near the coast, it is mostly on a slope at an altitude of between 10m and 50m. Also, before the disaster, the center of the district was to the southwest of the Amaterasumioya Shrine, the local Shinto deity. This is not, however, the location and spatial composition of the settlement from long ago as it had been moved little by little to higher ground after the Sanriku tsunami of 1896 (the Meiji era) and 1933 (the Syowa era).

Yamaguchi Yaichiro, who dedicated himself to studying and putting into practice ways to protect the settlement from tsunami, introduced the Kirikiri district as the ‘Utopian Village of Kirikiri’ in the famous book “Tsunami to Mura (Tsunami and Village)’\(^7\)” in which he compiled his own research on
the damage and recovery process after the 1933 Sanriku Tsunami, and where he also mentioned the process of relocating the village after the tsunami damage. According to this book, there were villages high up in the foothills of the mountains in ancient times, but by the time of the 1896 Sanriku Tsunami, they had formed a fishing village near the coast and suffered severe damage with 100 out of 160 dwellings washed away. Later, about 50 dwellings relocated to slightly higher ground in the mountain skirts, but some of them moved back to the settlement due to the inconvenience of sourcing drinking water and difficult access to the beach. The 1933 Sanriku Tsunami caused severe damage with 105 houses out of 275 being washed away, thus, and as a fundamental measure for permanent protection, group relocation to the higher ground was implemented.

That higher ground is shown in Fig. 2 as the neatly subdivided area to the southwest of Amaterasumioya Shrine. According to Yamaguchi, the land was previously a farmland and used to be traded at between 5 and 10 yen per tsubo (1 tsubo = 3.3m²) before the 1933 tsunami. A total of 8,000 tsubo were bought at a flat rate of 2 yen per tsubo. A typical residence was 50 tsubo (5x10 plots) while a landowner could have 60 tsubo, coming to a total of 98 houses. In addition, plans included assembly spaces and public bathing facilities, water supply and roads, leading to the ‘construction of a bright utopian village.’ This plan was consolidated as ‘Kirikiri Buraku Shin Gyoson Kensetsu Keikaku Youkou (Guideline for construction plans for the new Kirikiri fishing village).’ In addition to the local government of Otsuchi Town, local industrial and fishery unions played important roles in the realization of the plan along with 12 planners, including the prefectural chief officer of the interior, thus, it has been recognized as a progressive endeavor in terms of the collaboration of experts, local groups, and the administration 9).

What is more, this plan was drawn up in only four months after the disaster and so it is amazing in terms of speed as well as its contents.

(3) The Great East Japan Earthquake’s damage
The maximum inundation depth caused by the Great East Japan Earthquake was 16.1m, greatly exceeding that of the 1896 Sanriku Tsunami, which had held the previous record at 10.7m, and during which, a majority of the residences previously mentioned on the higher land to the southwest side of the Amaterasumioya Shrine were badly damaged. The catastrophe resulted in 97 fatalities and missing (March 2014), 355 completely destroyed buildings, rising to 424 when the partially or badly damaged buildings were included (September 2011) 10).

3. PROCESS AND CHALLENGES OF THE TOWN RECONSTRUCTION PLANNING AND THE SPATIAL DESIGN

(1) History of the town reconstruction planning
Table 1 summarizes the process of the spatial design of the Kirikiri district, in particular within the town reconstruction planning of Otsuchi Town from immediately after the disaster to the present. Comparing this with the progress of spatial design in the district, it can be roughly divided into the following four stages.

1) Reconstruction plan objectives and decisions on the collective residential area
: From the time of the disaster up to December 2011, when the preliminary reconstruction plan of Otsuchi was drawn up.

2) Decisions on the structure of the district
: From when the preliminary plans were drawn up until June 2013, when the changes in the alignment of the seawalls were agreed on.

3) Decisions on the spatial image of the town reconstruction
: From the beginning of the Otsuchi Design Council to March 2013, when the Otsuchi Design Notes which expressed the spatial image of each town reconstruction were drawn up. (detailed in (4)).

4) Specific studies of public spaces and public facilities
: From the fiscal year 2014 local reconstruction council to the present.

In the following sections, I will describe the process and characteristics of spatial design step by step. The important relevant organizations and roles for the town reconstruction planning of the Kirikiri district are shown in Fig. 4.

(2) Reconstruction plan objectives and decisions on the collective residential area
a) Background of the study

Otsuchi Town also lost their mayor to the tsunami;
thus, the reconstruction plan was launched in earnest after the new mayor took office in September 2011. However, preparation work had been going on previous to the launch. From June of the same year, Otsuchi Town Office, the City and Regional Development Bureau of the MLIT, Professors Yu Nakai and Kenjiro Omura (who are experienced supervisory academicians), the planning teams (TO-KEN C.E.E. Consultants Co., Ltd, Yasushi Onodera Civil Engineering & Landscape Architecture Design Office, EAU Ltd, and the author) all met and started studying the outlines of reconstruction patterns. In July and August especially, there were five survey office meetings and four brainstorming storms and intensive discussions. The basic concept of the town reconstruction planning was summarized, and preliminary reconstruction concept plans for the five areas along the coast that were especially badly damaged (Machikata, Ando, Akahama, Kirikiri, and Namitta) were drawn up. The issues related to
the basic concept for the reconstruction planning were the need to respond to the population decrease, maintaining the community spirit, recomposing the landscape, tsunami prevention, and the evacuation system.

Ikarigawa Yutaka, the new town mayor who took office in September 2011, indicated a policy of working on the reconstruction plan with the residents playing a central role and established the Local Reconstruction Councils formed by the residents in each of the 10 damaged settlements in the town. In each council, there was participation from the town office, planning team, and coordinators’ group (Table 1) and discussions were carried out on the provisional plans and reconstruction plan policies based on the preliminary reconstruction concepts described before. Discussions were held in each council about once a fortnight from October to November, and then drawn up as a reconstruction plan draft of that council. Finally, the councils submitted their proposals to the town office, and the town office decided on the basic reconstruction plan in December based on those proposals.

b) Local Reconstruction Councils’ conference details

Table 2 shows a summary of Kirikiri district Local Reconstruction Council. The council’s method for progression was to consult with Mr. Fujimoto, the representative of the local residents. To allow as many people as possible to speak out, the second time took on the style of a workshop, and the third and fourth ones invited participants to gather around in a circle. In the discussion, we used big planning drawings that basically included the whole district area.

At the first council meeting, opinions that would be the basis for discussions were shared, such as the positioning of the council, preliminary reconstruction policies, and ideas for tsunami protection. Then, as an example of a reconstruction pattern, suggestions were made such as to collectively move towards the mountains without relocating the previous district center but with some parts transferring to the higher ground connecting with the already existing settlement between the JR Yamada line and the mountains. Many opinions were submitted in the height difference of the seawall which would influence tourism and utilization of the beaches (one 12.8m high seawall (L1 proof) and the other 6.4m (the old height; Chile tsunami)).

At the second meeting, each town block association was divided into three groups and the above topic was freely discussed and presented. As the districts had held their own discussions after the first council meeting, many specific opinions such as possible residential sites for the transfer to higher land were raised from each group. Each group also pointed out the need for the preservation of the beaches and the seaside prosperity. As for the residential area, there was also the opinion that if safety could be guaranteed, there was a preference to continue to live in the same place after the ground had been raised. On the other hand, discussion on the seawall needed to be continued as opinions were divided.

At the third meeting, the chairperson reported that as a result of the second local district discussion a week prior, the number of people hoping for the 12.8m high seawall was in the majority, and the enlargement of the town center and a proposed site for the transfer to higher grounds were introduced. After further discussions held after experiencing the height of the seawall using the wall of the venue and a 1/50 scale model, there was still concern about the lower seawall and so agreement was reached on 12.8m for the height. The issue regarding the enlarged region of the town center and the proposed site for the transfer was largely settled, and in the next meeting the opinions so far would be organized, and the reconstruction ideas and plan diagram would be finalized.

At the fourth meeting, after the chairperson reported on the third local district discussion and confirmed the secretariat’s summarized opinions put forth so far, proceedings went ahead. The scale of the relocated residential area was to be decided

<table>
<thead>
<tr>
<th>Dates</th>
<th>The number of participants</th>
<th>Discussion themes and content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st 16. Oct. 2011 116 people</td>
<td>- Sharing ideas that are the basis of discussion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Presenting examples of reconstruction patterns and free discussion</td>
<td></td>
</tr>
<tr>
<td>2nd 30. Oct. 2011 70 people</td>
<td>- Presenting two seawall plans with different heights</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Workshop-style free discussion and presentation</td>
<td></td>
</tr>
<tr>
<td>3rd 13. Nov. 2011 74 people</td>
<td>- Presenting two seawall plans with different heights and reflecting opinions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Free discussion sitting in circle</td>
<td></td>
</tr>
<tr>
<td>4th 27. Nov. 2011 68 people</td>
<td>- Confirming the proposed plan of the local reconstruction council and summarizing discussions</td>
<td></td>
</tr>
</tbody>
</table>
Kirikiri district reconstruction policy

1. Basic thinking
- Restore the beautiful Kirikiri area where both residents and visitors can feel the connection to the sea, making use of the attractive geographical advantage of the settlement spreading from the lowland up the hillside facing the fish-arena, fishing port and the sea with sandy beaches.
- Restructure the settlement into a safe and sustainable community by relocating the residential area to the mountain side while leaving the center of the town that was created by the residents themselves in the reconstruction plan after the 1933 Sanriku Tsunami.

2. Reconstruction policy
- In order to retain the town center as before the disaster, an arterial road is to be laid inside of National Route 45, and by raising the ground level on the mountain side build a residential area that will include commercial facilities. Also, some of the areas that are to be newly considered for relocation sites and developed for residential and disaster public housing include around the Kirikiri Junior High School, along the west side of National Route 45, and the 4-chome area of Kirikiri.
- Choose a site with the potential for day-to-day use, new evacuation routes to higher ground over the JR Yamada line and ensure multiple evacuation routes to the higher ground of each region as well as considering widening the existing road network.
- Prevent residence in the dangerous lowland area, and set up parks, planted areas and sightseeing facilities.
- Restore the sandy beach, which is an important tourism resource of the region, and by implementing spatial improvements which offer a sense of unity with the settlement and sandy beach at the boundary division of the sea and settlement, enable coastline visitors to evacuate quickly when a natural disaster strikes, as well as creating an attractive place where people can feel a connection to the sea.
- Develop the fishing port and the necessary related facilities at an early stage.

![Fig. 5 Policy of the reconstruction plan of the Kirikiri district and plan figure of Kirikiri district Local Reconstruction Council.](image)

by surveying the residents’ intentions on choosing either the raised ground area in the center or the upland area; an open space was added to the retail stores that the residents would use in the center of the district, and all the reconstruction plans for the region were put together in a diagram (Fig. 5). In the town’s basic reconstruction plan, the objectives and ideas for the town reconstruction planning based on the discussions in the councils, and the reconstruction plan diagram were published as the base.

(3) Decisions on the structure of the Kirikiri district

a) Investigation system
Fiscal year 2012, after the formulation of the basic reconstruction plan, was set as the goal to realize the preliminary plan based on the discussions in the Local Reconstruction Councils, and the end of September as the deadline to decide the urban planning of the land readjustment projects, and for procedures like gaining ministerial authorization for the collective disaster prevention relocation. The examination of the spatial design was carried out by the working team for each district: those in charge of each district from the town’s urban development section, the planning team, and the coordinators from the basic reconstruction planning period.

b) Structure concept and process leading towards decisions
Even though the collective residential area and the policy of the reconstruction plan were largely decided during the discussions in the local reconstruction councils described in the last paragraph, there were three issues yet to be cleared in order to realize the image submitted by the council. Specifically, 1) relocating the national highway to fit the shape of the collective area on the skirts of the mountains, 2) setback of the seawall for preservation of the sandy beach and retaining the connection to the sea, and 3) spatial composition of the interior of the area that maintains the local community and which is conducive to easy evacuation. From early on, 1 and 2 were especially recognized as being challenging by the parties concerned, but they could not be reflected in the basic reconstruction plan under such uncertain circumstances without discussing them with the administrators.

As other districts were also dealing with the same issues, in January 2012 Professor Nakai proposed that the coordinators draw up a concept diagram to actualize the discussions in the Local Reconstruction Councils. I consulted with the planning team and drew up Fig. 6, and the reasoning is discussed be-
At the Local Reconstruction Council, there are many opinions to keep living with the sea, and I wanted to realize this opinion for the space. I focused on the reconstruction plan of the 1933 Sanriku Tsunami. In the plan, there was a road connecting the residential area and the sea. Following this plan, I thought that it is important to set the road links, the sea, and town as the center of the reconstruction plan.

Building ‘Umi no Jiku (Sea Axis)’ from Konpira Shrine to the sea will link the town and the sea making the most of the subdivisions in the 1933 Sanriku Tsunami reconstruction plan. The ‘Yama no Jiku (Mountain Axis)’ is built crossing the ‘Umi no Jiku’ road linking the town to the higher evacuation sites (primary school, railway station and junior high school, etc) and is built utilizing the pre-existing road. With this, the everyday traffic flow and evacuations routes are matched up and so a smooth evacuation can be expected. A ‘Machi no Hiroba (Town plaza)’ is built in the town center along the sea axis along with those facilities that would be used daily, like the post office and shops, creating a gathering space to be the heart of the community. Furthermore, on the seaward side of the ‘Umi no Jiku’ road, as a place where both visitors and residents can enjoy the sea, a flat area to be named ‘Umi no Hiroba (Sea Plaza)’ was established where the national highway and set-back seawall intersect. With this, the plan is to ease access to the coast as the districts and the top of the seawall are connected at almost the same height.

This concept sketch became the base diagram for the respective district WG after April, and town planning for land readjustments, the study of public space allocation, and national highway and seawall negotiations moved forward. Then in June, agreement was reached with the Sanriku National Highway branch of the National Highway administrators to proceed with the study of provisionally relocating the national highway. Moreover, at the end of September the urban planning for the land readjustment project was completed, and ministerial authorization to promote the collective relocation for disaster prevention was obtained.

On the other hand, the seawall-related documents were finally sent from the Iwate prefectural government in November, however, the seawall had a 20% grade on the back and the front was practically vertical, and the linear shape was the same as the existing one. Consultations were held with the team.
assigned from the town and the planning team and they submitted the request to change the plan to one proposing the set-back of the seawall alignment with a gently sloping retaining wall along with a comparative table from the perspective of economics (Fig. 7). evacuation from the coast, and consistency of the district reconstruction plans, adequately citing the MLIT’s guideline and Iwate Prefectural government’s guideline.

The Iwate prefectural government responded by saying that the town would have to bear the full costs if it were to implement the proposed plan. To this, even though the town explained that the plan would not raise the construction costs, and requested cooperation with the regional plan and explained that it complied with the guidelines of the Iwate prefecture and national government, negotiations collapsed with the issues unresolved. Therefore, it was believed that the only option was to attempt to be consistent with the districts’ plan while following the initial prefectural seawall plan.

However, in April 2013, the newly assigned supervisor in the Iwate prefectural government showed keen interest in the requested plan, and negotiations reopened. As a result, thanks to his dedication and backup from the town office, coupled with cooperation from the Sanriku National Highway office, a seawall plan very close to the originally desired one went ahead in June. Thus, 18 months after the preliminary plan, the district structure shown in Fig. 8 was settled on.

In efforts such as reconstruction plans that require coordination with many related organizations, it is important to first create a concept sketch for the whole district, then coordinate with related organizations based on this sketch.

I will not describe in detail the land readjustment investigation process or the possible sites for the collective relocation and the negotiation process involved, but I would like to mention that it was only achieved with a tremendous amount of research and various discussions on the parts of the teams assigned from the town office and the planning team.

(4) Decisions on the spatial image of the town reconstruction

a) Summary and aim of the Otsuchi design conference

As the decisions on the local area framework were partly determined in 2012, 2013 was the year when the spatial design plan became a reality. However, even in one district there are different project contractors and the details are varied so measures were needed to avoid the total break-up of the town. Discussions with Professor Nakai centering on the town office took place, and as a result the Otsuchi Design Council was selected. This conference aimed to lead to a comprehensive design for a whole town or district by developing spatial images of the whole district centered on public spaces and facilities.

The conference was made up of a plenary session with the representatives of each district and three academic experts (chairperson: Professor Nakai, University of Tokyo) and each district WG. This WG received support from the planning team assigned from the town office and academic experts as before.

<table>
<thead>
<tr>
<th>Dates</th>
<th>Discussion themes and content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>- Shared sense of purpose at the meetings.</td>
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<tr>
<td>1st district WG</td>
<td>- History explanation and simple exchange of opinions.</td>
</tr>
<tr>
<td>2</td>
<td>- Coordinators present draft proposals for discussion.</td>
</tr>
<tr>
<td>2nd district WG</td>
<td>- Exchanging opinions on spatial images.</td>
</tr>
<tr>
<td>3</td>
<td>- Exchanging opinions based on image sketches that reflect the discussion in each respective area’s WG conference.</td>
</tr>
<tr>
<td>1st reconstruction planning workshop</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>- Exchanging opinions on use and location of the streets, plaza and public facilities such as disaster public housing and community centers, using models and image sketches.</td>
</tr>
<tr>
<td>2nd reconstruction planning workshop</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>- Revising and confirmation of the materials summarizing the results of the reconstruction plan WS.</td>
</tr>
<tr>
<td>3rd reconstruction planning workshop</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>- Confirm that the proposal on the location of public facilities and spaces, as well as discussions to date, was delivered to all households in the form of a circulating bulletin board.</td>
</tr>
<tr>
<td>3rd district WG</td>
<td></td>
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<tr>
<td>17. Oct. 2013</td>
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<tr>
<td>7</td>
<td>- Revision and confirmation of the materials summarizing the results of the reconstruction plan WS.</td>
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<tr>
<td>4th district WG</td>
<td></td>
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<tr>
<td>15. Nov. 2013</td>
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<tr>
<td>8</td>
<td>- Confirm that the proposal on the location of public facilities and spaces, as well as discussions to date, was delivered to all households in the form of a circulating bulletin board. Discussion on more specific spatial images and use of public space using sample photos.</td>
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<tr>
<td>5th district WG</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>- Discussion on any additional items and confirmation on the presentation of the Kirikiri district Design Notes.</td>
</tr>
<tr>
<td>6th all district WG</td>
<td></td>
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<tr>
<td></td>
<td>- Area presentations.</td>
</tr>
<tr>
<td></td>
<td>- Submit the Otsuchi Design Notes with added design objectives for the public spaces and facilities to the mayor from the Otsuchi Design Council.</td>
</tr>
</tbody>
</table>
(A) **Town reconstruction planning objectives**

"Urban renewal for everyone to keep living with the sea, the mountains and others in the district"
- Create a beautiful town surrounded by greenery and connected to the sea
- Create a gathering place where people can meet anytime
- Create a town walkable for all ages
- Create a town strong in the face of disaster where roads and places for daily use turn to evacuation routes and activity bases

(B) **Town plaza where everybody gathers**

1. In order to form a place that will become the core of the local community, create a town plaza and community center as a set in the middle of the town center along the Umi-no-Jiku (Sea axis). Moreover, so that people will drop in at the plaza naturally, places that are used daily such as the post office and commercial facilities are located around the plaza.

(D) **Green streetscape and walkable streets**

- In order to make a walkable town, give priority to pedestrians on all roads. Make roads that give an overall unified impression based on the paving design of the Umi-no-Jiku.
- To create pleasant, walkable streets, draw up guidelines for housing in the district and request compliance of the people rebuilding houses.

(C) **The Umi-no-Jiku (Sea axis) that links the sea and town**

- The Umi-no-Jiku (Sea axis) (area 8-1, area 8-3, Park No.2) is the most important road in the structure of the town as it simultaneously functions as a public footpath to the sea and a connection to the evacuation route to higher ground.
- Therefore, public spaces such as the town plaza and community center are located along the Umi-no-Jiku, and it is developed as a continuous plaza space from the town to the sea plaza and beach.

2. **Town section**

- The residential areas such as the disaster public housing along the road should be developed in an integrated fashion with the road in order to make it like a plaza, where one can linger and feel the sea and greenery. Place small plazas with pump wells on street corners, and benches and trees along the road.

3. **Town park No.2 section**

- Lay a path for a walking trail to the sea at the same time as planting trees bringing seasonality to the park, and creating a place for ohanami (cherry blossom viewing).

4. **The plaza and sandy beach leading from the Umi-no-Jiku**

- Create a sea plaza by raising the ground level of the area between the national highway and seawall so that the sandy beach and Umi-no-Jiku are smoothly linked. Locate a car park, viewing platform and local produce market in the plaza, creating a busy place unified with the sandy beach and gently sloping seawall.
The outcome of almost a year’s work from March 2013 was consolidated as Otsuchi Design Notes, about 50 A3 pages for five districts (Fig.9).

b) Background to discussions and characteristics of the Kirikiri district

Table 3 shows an outline of events in the Kirikiri district. As the area was to go through a review of the temporary reploting in the Land Readjustment Council in about December, it seemed important to consolidate local residents’ opinions on the allocation of public facilities and communal space in the district beforehand. Therefore, after consultations with the town office and the chairperson, Fujimoto, and in addition to district WG, a reconstruction planning workshop centering on the WG members, the district’s board members, and the younger members was to be held three times from August to October hoping for intensive discussions to take place.

The district WG and reconstruction planning WS were basically conducted as follows. At the first discussion only (second), a draft proposal was submitted for discussion by the coordinator expressing in words places and their images important for reconstruction. Then, residents were invited to address their opinions on the location and use of the communal space and public facilities such as the plaza and community center, disaster municipal housing and firefighting stations. In the next session, participants viewed spatial images that had been drawn up in sketches and diagrams based on the opinions from the previous session, and then held discussions once more. This was intended to lead the discussion on the spaces from the point of view of their relationship with other places or the district as a whole. According to the hand-drawn plans, sketches and models, the number of opinions regarding the practical spatial visualization increased as the sessions went by. The subject matter was not only limited to the public spaces, but also developed into discussions on creating a streetscape that is a joy to walk in, with ideas about the residential side such as unifying the roof color, planting hedges along boundaries, and naming the streets. In addition, some voluntary actions by the local residents were proposed. These included locating the disaster public housing where the access by the elderly person was expected near the town plaza, to planting cherry trees which the local residents volunteered to do after an earthquake disaster in the park, and planting a Nippon chrysanthemums about the residential side such as unifying the roof color, planting hedges along boundaries, and naming the streets. In addition, some voluntary actions by the local residents were proposed. These included locating the disaster public housing where the access by the elderly person was expected near the town plaza, to planting cherry trees which the local residents volunteered to do after an earthquake disaster in the park, and planting a Nippon chrysanthemums

Thus the Kirikiri Design Notes were consolidated in a six-sheet set. The first sheet is titled ‘Policies and basic concepts of town planning’ and it summarizes the policies of the town reconstruction planning in the district and the concept of the whole district centering on the five important spaces (within the frame of the diagram) (Fig.9). The second page covers each of the five important spaces and in addition to the sketches and depictions with important items written in, includes opinions from the WGs and WSs arranged into themes.

The key characteristic was where the concept of the plan was described utilizing activity scenes. Thus, the reasons for deciding certain positions for each space, together with spatial images and what was to be valued were intended to be easily understood.

Eighteen months have passed since its production, and while some parts had to be changed for unavoidable reasons, such as a blueprint illustrating the town reconstruction planning, the Design Notes were well accepted by the parties concerned, and seemed to function as intended at the time of their inception. Also, after their collation, there were joyful cries from local residents upon seeing a vision of the project after the reconstruction. In that aspect it was significant.

(5) Detailed study of the public spaces and facilities

From fiscal year 2014, the fourth year on, a detailed study of public spaces and facilities was conducted as a continuation of the Local Reconstruction Councils whose theme from fiscal year 2013 was the Community Reconstruction. At the same time, a preliminary landscape plan focused on the streetscape also started. I will describe the district reconstruction council here.

The Local Reconstruction Council with the above theme convened four times in the Kirikiri district (Table 4). In the first council, with the revision of the Design Notes, the image of the reconstruction of the whole area, and in the second council, the ‘Umi-no-Jiku’ (Sea Axis), town plaza, and the sea plaza which were to be the new center of the town were all discussed from the perspective of utilization. Among them, it was decided to carry out a more

<table>
<thead>
<tr>
<th>Dates</th>
<th>Discussion themes and contents</th>
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<tr>
<td></td>
<td>- Exchanging opinions and reconfirming the Design Notes.</td>
</tr>
<tr>
<td>2nd 12. Sep. 2014</td>
<td>- Discussing the utilization of the sea plaza, town plaza and Umi-no-Jiku (Sea Axis) that make up the new town center.</td>
</tr>
<tr>
<td>3rd 27. Oct. 2014</td>
<td>- Discussion on the specific space in the town plaza and community center where children and local residents will gather.</td>
</tr>
<tr>
<td>4th 7. Feb. 2015</td>
<td>- Confirming the discussion contents to date.</td>
</tr>
<tr>
<td></td>
<td>- Discussion on community activities and the sea plaza.</td>
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(1) Advantages of the local collaboration style town reconstruction planning

One major characteristic of the process of spatial design for the Kirikiri district was that it developed into the implementation plan without any large alterations to the basic policies of the preliminary reconstruction plan drawn up at the end of 2011 or the concept plan drawn up in early 2012. This is not an isolated occurrence in Kirikiri, but is common in the spatial designs across the whole of Otsuchi Town, and can be explained by the fact that the plan was worked with local residents right from the early stages.

This working practice, as a result, brings about other effects such as time effectiveness and advantageous negotiation results with interested parties. For example, in the autumn of 2011, Otsuchi Town was so far behind compared to the surrounding cities, towns, and villages that it was practically ‘a lap behind,’ but after that, Otsuchi’s progress seemed to catch up and overtake the others. Also, when negotiating with the state or prefecture, it seemed that plans which had already been authorized locally were easier to set as the basis of planning decisions.

Generally speaking, it is often said that town planning involving public collaboration takes longer, but in the case of town reconstruction planning, it is worth mentioning that conversely it has time-related merits as well.

In order to proceed with the residents’ agreement, we devised the following two points. The first is to present visual and quality materials and explain without using technical terms as much as possible. Secondly, it is to summarize opinions from residents at the conclusion of the meeting and to organize the modifications of the plan, and to reflect it in the next plan without fail. It was particularly noticeable when working on the Design Notes: the format based on the spatial scenes made it easy to produce detailed images and various ideas, and the plans themselves were thoroughly shared, so I was made aware of its effectiveness as a method. What made such a format possible was largely the early involvement in the planning team of a design office specialized in spatial design, and I would like to point out once again the importance of the total design.

(2) Challenges for the future of the tsunami reconstruction plan

On the other hand, many issues concerning the tsunami reconstruction plan still exist. Here, I would like to point out the issues on land acquisition in terms of planning theory and the limitations of the...
land readjustment project as they relate to the fact that it is very difficult to rebuild a town in the same residential area as before the disaster, which is a major characteristic of the tsunami reconstruction plan.

a) Limitations of the land readjustment project

The most commonly used method for the reconstruction plan of residential areas in the overall reconstruction plan is the land readjustment project. This is an urban planning method that creates a good living environment while simultaneously securing the project budget by selling off land after raising its value by reshaping the sites and providing parks and roads where once the land had not been efficiently used due to a lack of infrastructure such as roads and where each site was irregularly shaped. In Japan this is commonly used especially in urban areas where land prices are high, and it was used in the reconstruction plan of the 1995 Hanshin Awaji Earthquake.

However, one of the applicable conditions for this method is that the residential area does not change before and after the improvements, and this was a major issue for the tsunami reconstruction. Taking the Kirikiri district as an example, the reconstruction plan aims to prevent inundation from tsunami, and in order to respond to the decreasing population, an area smaller than the one before the disaster was designated as the new residential area, in implementing the land readjustment project (Fig. 11). Therefore, existing landowners of the new residential area are subject to the land readjustment project and their land is secured, but the owners of land outside the hazardous area must buy land in order to rebuild a house within the area of the land readjustment project, and in the case of being unable to afford it, they must move to higher land. On the other hand, within the land readjustment project zone, there are landowners who do not need to rebuild a house as they have one elsewhere, or others who cannot sell the land because of a mortgage. Accordingly, a landowner from outside the land readjustment project zone who wants to rebuild a house cannot buy land, and as a result there is the problematic possibility that some plots in the land readjustment project zone will be left empty.

In the land readjustment project, there is the principle of substitution plots at the original position which means that a landowner is given substitute land near the original position. There is also a problem where the land may not be substituted as desired even when, for example, the residents wished to allocate shops around the plaza as shown in Fig. 9, as the last decision-making rights lie with each landowner.

To resolve such problems, the local municipality could make a blanket purchase of the reconstruction plan. However, there was a fear of a possible population outflow to other inland regions at the time of the disaster, and so it was likely difficult to adopt for those municipalities aiming for reconstruction. From that perspective, in reality there was probably no better method than the land readjustment project, but in the future a study on urban planning taking such situations into consideration is needed.

b) Site acquisition issues in terms of planning theory

The reason the drafting of the reconstruction plan took so long was the procedures for site acquisition. A definite number is needed for relocation to the upland in the tsunami reconstruction plan. However, in many cases, the proposed site is mountain forest or farmland, and has not always been registered on the cadastral map by modern land survey methods. Although the MLIT had recommended drawing up the cadastral map by modern land survey methods nationwide before a disaster for quick recovery, only 44% of the cadastral survey had been conducted in Otsuchi by 2015. Below, I would like to point out some issues in connection with the process of drafting the reconstruction plan.

Figure 12 summarizes the course from the drawing up of the reconstruction plan to site acquisition negotiations. At the planning stage, the investigation of proposed sites for relocation are conducted...
in terms of safety and ease of living. Next, when the plan has been drawn up, site acquisition formalities begin but there can also be issues on identifying landowners at the negotiation stage as shown in the diagram, which is very time consuming. Even more time is needed if negotiations come to a halt and plan revisions are required. Then after negotiations of site acquisitions are finalized, the confirmation of site boundaries is conducted along with the landowners and finally the plan can be formalized.

Even though, thanks to cooperation from the local residents, land acquisition negotiations were rather quick in Kirikiri, it still took a year. The author was involved in a different district where the land acquisition negotiations were very difficult, forcing plan revisions a dozen times and eventually taking over two years, and delaying reconstruction.

From the aspect of these problems, the advance reconstruction plan, which is currently being worked out throughout Japan, should be very effective.

5. CONCLUSION

The results of this study are as follows: The author gave an account of the process of the town reconstruction planning in collaboration with local residents and its spatial design, targeting the Kirikiri area of Otsuchi Town, Iwate Prefecture, which sustained severe damage from the tsunami triggered by the East Japan earthquake. This account was divided into four stages: 1) decisions on the reconstruction plan objectives and collective housing scope; 2) decisions on the structure of the district; 3) decisions on the spatial image of the reconstruction planning; and 4) a detailed study of the public spaces and facilities.

Some of the advantages noted during the tsunami reconstruction planning in collaboration with local residents included being able to avoid having to rework the plans and thus shorten the time needed for reconstruction; negotiations with the organizations concerned can progress more efficiently; and local residents can recognize the image of the town after reconstruction, triggering various activities aimed at reconstruction. It was also pointed out that the importance of the involvement of spatial design experts from the early stages of the planning was a condition for this.

As to the future challenges for the tsunami reconstruction plan, I pointed out specific issues about site acquisition as seen from the perspective of planning theory, and on the urban planning method of land readjustment projects.

Presently, site preparation is in progress but there are still items that need studies and adjustments before completion, and I would like to continue contributing towards an even more attractive town planning in the future.

ACKNOWLEDGEMENTS: The town reconstruction planning of the Kirikiri district was carried out centered on the Otsuchi Town local authorities including local residents or support staff from other municipalities, as well as consultants and design offices in charge of planning, and academics including the author. This essay is written from the author’s perspective and all responsibility for the contents lie with the author. I would like to express my sincere appreciation to everybody involved and hope that these spatial designs contribute to the reconstruction of an attractive Kirikiri.

REFERENCES

10) Quotation of the Geospatial Information Authority of Japan (GSI) HP.

Fig.13 Construction situation of Kirikiri district (Mar. 2016).