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CPIJ Newsletter

The Great East Japan Earthquake



INITIATIVES BY THE CITY PLANNING INSTITUTE OF JAPAN IN RESPONSE TO THE GREAT EAST JAPAN EARTHQUAKE DISASTER

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Introduction

On March 11, 2011, a powerful earthquake of magnitude 9.0 struck at 2:46 p.m., triggering massive tsunami waves that devastated eastern Japan. The death toll has surpassed 10,500, with close to 9,000 still unaccounted for. We would like to express our condolence and sympathy to those who lost their lives, those who fell victim to the disaster and those who still live in an evacuation shelter.

The City Planning Institute of Japan (hereinafter CPIJ) decided immediately after the disaster to set up a special committee. A preparatory task force has been launched subsequently. Meanwhile, the CPIJ received 73 suggestions from its members after a request for proposals went out. On April 22, the CPIJ board approved the special committee's agenda and organization framework.

In addition, the CPIJ, the Japan Society of Civil Engineers and the Japanese Geotechnical Society have jointly conducted a preliminary field survey from March 27 to April 6. The CPIJ, working in concert with the Japan Society of Civil Engineers, has also dispatched another team (the second survey team) to the region from April 29 to May 7 to survey eastern Japan for infrastructure rebuilding. Meanwhile, the special committee's core members are traversing the ravaged areas

to gain a comprehensive understanding of the scale of the damage. Reports on this series of activities have been presented in an emergency briefing held on May 27.

A month after the catastrophe hit, the Japanese government set up an advisory panel under the name of the Reconstruction Design Council in Response to the Great East Japan Earthquake to discuss and make recommendations on a framework for reconstruction to formulate guidelines for the reconstruction of areas devastated by the Great East Japan Earthquake. The prefectures of Iwate, Miyagi and Fukushima have also undertaken rebuilding efforts. In the meantime,

heads of the seven construction-related academic societies have made joint appeals and recommendations to the Japanese government and provided information to the general public through organizations such as the construction-affiliated groups' coordinating committee in response to disaster and the Science Council of Japan.

The project committee has also held eight consecutive informal discussions beginning on May 9 with experts in relevant areas who may play critical roles in formulating reconstruction plans. I would like to take this opportunity to express my deepest gratitude to those of you who took time off your busy schedule

Activities undertaken by the CPIJ since March 11

March 14	Held an extraordinary session of the board meeting over the web Approved a go-ahead to set up a special committee on disaster prevention and reconstruction issues
March 22	Held the first preparatory meeting of the special committee on disaster prevention and reconstruction issues
March 25	Sent out a request for proposals on reconstruction assistance
March 29	Held the second preparatory meeting of the special committee on disaster prevention and reconstruction issues
April 1-7	Dispatched the first joint survey team in partnership with the Japan Society of Civil Engineers and the Japanese Geotechnical Society
April 4	Held the third preparatory meeting of the special committee on disaster prevention and reconstruction issues
April 15	Held the fourth preparatory meeting of the special committee on disaster prevention and reconstruction issues
April 22	A board meeting approved the specifics for the special committee on disaster prevention and reconstruction issues (among other things, organization and committee members)
April 29 -May 2	Field survey

to make your valuable contributions.

We received the messages of sympathy from overseas urban planning groups in countries and regions such as Korea, Taiwan, China and Hong Kong. On behalf of CPIJ I would like to express to all of countries my deepest gratitude for your warm concern and support. We sincerely hope further collaboration.

We will work with a broad spectrum of organizations to formulate reconstruction plans for the ravaged cities and to help with the early implementation of those plans. Along with our members, the CPIJ will continue to do its utmost in providing cooperation and support.

Initiatives Undertaken by the CPIJ

In response to the Great East Japan Earthquake on March 11, 2011, the CPIJ held an extraordinary session of its board meeting over the web on March 14 and gave a go-ahead to set up a special committee on disaster prevention and reconstruction issues. Mr. Haruhiko Goto, the Vice Chairman, immediately took the lead to convene preparatory meetings. Four preparatory meetings have been held to discuss topics that included the special committee's chairperson and operation.

The CPIJ, through the special committee on disaster prevention and reconstruction issues, has promptly set up a support system to help the ravaged regions recover and rebuild from the Great East Japan Earthquake. Efforts are also underway to study how to apply the lessons learned on urban and town designs in preparation for highly probable and potentially imminent seismic activities in the Tokai, Tonankai and Nankai regions.

(1) Organizational structure

The special committee shown in Fig.1 will carry out missions for the next three years.

(2) Basic policies

- Promptly ascertain the damage and the extent of damage.
- Propose ideas for reconstruction that

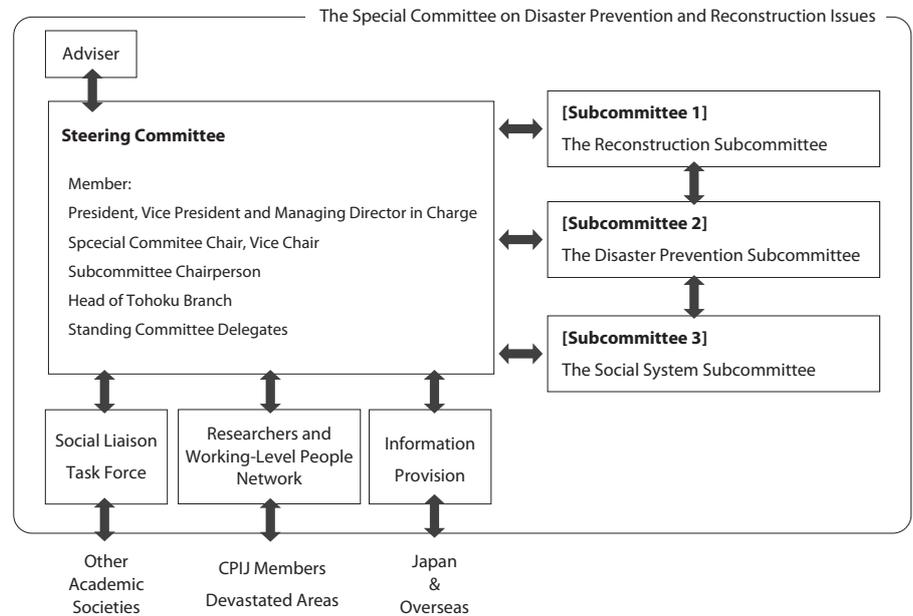


Fig 1. Organization Structure for CPIJ Special Committee on Disaster Prevention and Reconstruction Issues

can be implemented immediately based on the past studies and experience.

- Build a network of experts to support reconstruction.
- Urge young researchers and students to participate in damage surveys and reconstruction assistance.
- Conduct studies and make proposals on how to make urban designs safer from the view point of the history of civilization.

(3) Subjects of Discussion

Set up three subcommittees: reconstruction subcommittee, disaster-prevention subcommittee and social system subcommittee. Assign each subcommittee specific topics of discussion and activities. In addition, in order to make the activities of these subcommittees transparent, provide information as needed and document activities undertaken (archive).

Action Policies for the ThreeSubcommittees

[Subcommittee 1]

The Reconstruction Subcommittee

Propose recommendations and provide assistance for rebuilding municipalities

- 1) Build a system to support reconstruction plans
- Gather and accurately analyze

information on the national, prefectural and municipal governments' actions in the reconstruction process, and perform a comparative study on reconstruction process among Hanshin-Awaji, Chuetsu and eastern Japan regions to analyze and assess reconstruction process following the recent disaster

2) A system to coordinate municipalities, provide regional support and public relation collaboration

— Establish local bases for reconstruction assistance in collaboration with relevant entities, the Architectural Institute of Japan and the Japan Society of Urban and Regional Planners, among others

— These bases shall be open to anyone who wishes to participate and must be constructed as platforms to attract a wide range of information – such platforms with human resources and wisdoms will attract locals with reconstruction-assistance needs; CPIJ members shall disseminate such information

— There are needs for the experts working on site and the local governments to share information and for the construction of a platform that functions effectively as a place for gathering and discussing new information - jointly construct a base with the Architectural Institute of Japan and the Japan Society of Urban and Regional Planners at Kitakami City, where NPOs throughout Iwate prefecture have jointly

set up an office under the name of Iwate Coalition Reconstruction Center; and use this base to strengthen the network with Miyagi and Fukushima so as to build a Tohoku Town-building Platform to serve as a center for providing regional assistance and gathering information (personal proposal)

[Subcommittee 2]

The Disaster Prevention Subcommittee

Earthquakes registering an intensity of 7 on the Japanese seismic scale have hit Japan times over the last 16 years, causing massive devastation. The 1995 Great Hanshin Earthquake was characterized as an active fault-line urban epicentral earthquake, the 2004 Great Chuetsu Earthquake an active fault-line rural epicentral earthquake, and the 2011 Great East Japan Earthquake an ocean-trench coastal tsunami disaster.

The disaster prevention subcommittee is tasked with the following missions: first to learn from the damage caused by tsunami in the Great East Japan Earthquake, to identify urban and regional safety issues in the field of urban planning and to propose approaches to safety in urban planning; and second to come up with and propose approaches to safety in urban planning based on regional

characteristics and lessons learned from the Great Hanshin Earthquake and the Chuetsu Earthquake.

Specifically, the subcommittee is to undertake its first mission from the viewpoint of what disaster-preventing capacity and safety must be incorporated into the reconstruction plans following the Great East Japan Earthquake and to solve the challenge of restoring economic activities and housing while preventing the recurrence of similar devastations.

Second, the subcommittee is to carry out its mission from the viewpoint of how to apply the lessons learned from the Great East Japan Earthquake to the urban designs for the Tokai, Tonankai and Nankai regions that have been designated for reinforcement or promotion of seismic designs. Protection from tsunami is a safety issue that needs to be addressed to ensure safety for the eastern Japan region as it tries to recover from the devastation. It is also a very urgent issue that the western Japan region needs to confront.

Third, safety measures for a potential epicentral earthquake in Tokyo need to be addressed. Various safety measures are required. There is a need to study the concept of implementing multi-layered safety measures for large urban centers and take specific actions.

[Subcommittee 3]

The Social System Subcommittee

The subcommittee 3 is tasked with studying Japan's social system. In contrast with the subcommittee 1 (reconstruction), whose missions cover the three prefectures in the Tohoku region, and the subcommittee 2 (disaster prevention), whose missions cover large urban centers, this subcommittee is in charge of an issue that is not related to a certain area or size, but to determine what is required to reorganize Japan's social system to enable it to deal with large-scale disasters.

The methodology to accomplish this task can be divided into six subject areas: (1) lifeline; (2) medical; (3) logistic; (4) transportation infrastructure; (5) community; and (6) regional land use.

The subcommittee will identify the methodology to reorganize Japan's social system based on five approaches: (1) determine the targets of evaluation for the subject area; (2) long-term disaster-prevention and disaster-mitigation measures for the subject area; (3) emergency measures in times of disaster for the subject area, (4) "hard" plans and systems for the subject areas (2) and (3); and (5) "soft" plans and systems for the subject areas (2) and (3).

PRELIMINARY SURVEY REPORT OF CPIJ

ON AREAS DEVASTATED BY THE GREAT EAST

JAPAN EARTHQUAKE

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Preliminary Survey Team's Objectives and Itinerary

(1) Survey Objectives

After launching the special committee on disaster prevention and reconstruction issues, the City Planning Institute of Japan (CPIJ) along with the Japan Society of Civil Engineers and the Japanese Geotechnical Society jointly dispatched a preliminary survey team. The survey team included three CPIJ members, who jointly authored this paper.

Although the structural and ground damage caused by the seismic motion in the recent earthquake cannot be overlooked, they are overshadowed by the massive destruction created by the tsunami waves that followed. In this aspect, the Great East Japan Earthquake is different from other powerful quakes, such as the Great Hanshin Earthquake, Niigata Chuetsu Earthquake and Niigata Chuetsu-Oki Earthquake, which left only damage caused by seismic motion. Therefore, in the preliminary survey, we took an overhead view to survey the damage done by the tsunami waves to coastal urban areas from Iwate to Fukushima Prefectures. Our objectives were to compare the damage with those from the past earthquakes and to identify the characteristics of tsunami-caused damage sustained by urban and village areas.

(2) Survey Itinerary

The survey took place over a seven-day period from April 1 to 7. A synopsis of the survey team's activities is as follows.

April 1:

Traveled from Tokyo to Sendai; conducted an on-the-ground survey of the damaged Ishinomaki urban area; surveyed the cave-in site in Sendai-shi

April 2:

Aerial survey (from the Sennan area to the Southern Sanriku area); conducted an on-the-ground survey of the stricken urban areas (Fukushima Prefecture: Shinchichi-machi, Miyagi Prefecture: Yamamoto-cho, Watari-cho, Iwanuma-shi, Natori-shi, Ishinomaki-shi, Onagawa-cho and Minamisanriku-cho)

April 3:

Exchanged views with the chief of Tohoku Region Improvement Bureau; exchanged views with the Ministry of Land, Infrastructure, Transport and Tourism survey team, East Japan Railway Company and East Nippon Expressway Company Limited; conducted an on-the-ground survey of the stricken urban areas (Miyagi Prefecture: Natori-shi, the area around Sendai Airport and the Nanakitagawa area)

April 4:

Conducted an on-the-ground survey of the stricken urban areas (Miyagi Prefecture: Ishinomaki-shi

and Onagawa-cho, Iwate Prefecture: Rikuzentakada-shi, Ofunato-shi, Kamaishi-shi, Otsuchi-cho, and Rikuchuyamada-cho,)

April 5:

Meeting with mayors of Rikuzentakada, Kesenuma and Minamisanriku-cho; conducted an on-the-ground survey of the stricken urban areas (Iwate Prefecture: Rikuzentakada-shi and Kesenuma-shi, and Minamisanriku-shi)

April 6:

Conducted an on-the-ground survey of the stricken urban areas (Miyagi Prefecture: Onagawa-cho, Ishinomaki-shi, Higashi Matsushima-shi, Iwate Prefecture: Fudai Village, Tanohata Village, Miyako-shi and the Taro area of Miyako-shi)

April 7:

Press conference; traveled from Sendai to Tokyo

Overview of Urban Area Damage

Tsunami-related damage in the urban areas may be largely classified by their nature into two categories. One is the damage to the plains centered on the expansive Sendai Plain south of Sendai-shi (the Sennan area). The other is the extensive and devastating destruction to the urban and village areas on relatively

narrow strips of flat land located along deeply indented coastlines (ria coast). Buildings in urban areas located on high grounds or hills survived the seismic motion largely unscathed structurally. The ravages brought by the recent earthquake appear to be attributable primarily to tsunami waves that followed.

(1) Urban-area Damage in the Sennan Area

The Sennan area is made up of mostly swamps that are used as rice paddies. Pockets of homestead woodland that remained appeared to have been developed into residential and other uses. Quite a few urban areas appear to have been built on what used to be rice paddies. The Yuriage area of Natori-shi in Miyagi Prefecture, the Arahama district in Sendai-shi's Wakabayashi Ward and Shinchi-machi in Soma-gun, Fukushima Prefecture also have similar plains, where tsunami waves either breached or overflowed seawalls/tide-water control forests or river levees. In some urban areas, the tsunami waves advanced far into the interior of the plain and caused extensive damage (Photo 1). In coastal urban areas, most wooden structures were washed away except for their foundations. Even some steel-frame buildings were left with severely bent pillars and beams. Only reinforced concrete structures retained their exterior facades. The damage suggests that seawalls and other embankments failed to sufficiently reduce the height and speed of tsunami waves. Even for reinforced concrete structures, whatever existed inside these buildings were cleanly washed away, leaving only the main structures. Some of these buildings were even filled with a massive amount of debris (Photos 2 and 3). In Onagawa-cho, even some reinforced concrete buildings toppled over. Tsunami waves inflicted heavy damage to seawalls at many places and knocked or washed away the trees in tide-water control forests and pine trees off their roots (Photo 4). Most harbors suffered heavy damage to their port facilities. Survival appeared unlikely unless one evacuated to the nearby

hillside or the high floor of a reinforced concrete building.

From the air, however, some homestead woodlands and buildings within such woodlands appeared to have escaped unscathed even though the surrounding urban area and rice paddies suffered devastating damage from the tsunami. Photo 1 shows some of these homestead woodlands. Nevertheless, on-the-ground surveys found that most of these structures have been rendered unusable by debris even though they suffered little structural damage. Sporadic pockets of urban areas also escaped heavy damage. Field surveys of the homestead woodlands and structures that survived showed that the elevation of these homestead woodlands is slightly higher than that of their surrounding areas. While old villages were built with topographical conditions taken into consideration, new residential housing may have been developed without such a consideration. A quantitative analysis is probably warranted of the correlation between the geographical conditions of such areas and tsunami-related damage. The coastlines of such areas stood out as they tend to have tide-water control forests of a substantial width. The contrast could not have been greater as areas with relatively inadequate tide-water control forests suffered devastating damage. Parts of urban areas that escaped serious damage were protected by multiple layers of defense, including, among other things, seawalls, tide-water control forests, reinforced concrete buildings, rice paddies and roads on embankment (in some areas), which may have helped to blunt the force of tsunami (Photo 5). Such a strategy may be adopted by the plains area to defend against tsunami waves.

In the Sennan area, tsunami waves traveled several kilometers inland, leaving debris up to the East Sendai Toll Road (an embanked road), which runs in the north-south direction. However, no debris washed up to the west side of the road, suggesting the embanked road played a large role in reducing damage.



Photo 1 Aerial view of the coastal green-belt area near the Abukuma River



Photo 2 Aerial view of the stricken Yuriage area of Natori City



Photo 3 Devastation in the Yuriage area of Natori City



Photo 4 Tide-water forests in Yamamoto Town, Miyagi Prefecture



Photo 5 Urban area on the right bank of the Nanakitagawa that escaped serious damage

(2) Urban-area damage in Sanriku Area

The Sanriku area is typified by its deeply indented ria coastline. Its urban area and villages commingled with the harbor and port facilities on narrow strips of land. It has long been a harbor, with coastal fishery and aquafarming as its major industry. Tsunami waves that rolled into the inlets converged into a small area, exerting an external force with enhanced destructive power that devastated many urban areas and villages. The type of destruction, however, varied from one urban area to another. In areas such as Shizunai in Minamisanriku-cho, Rikuzentakada-shi, Otsuchi-cho and Rikuchuyamada-cho, the urban area's framework, outline and functions were almost completely wiped out. In other areas such as Kesenuma-shi, Ofunato-shi, Kamaishi-shi and Miyako-shi, the harbor and its surrounding neighborhood were heavily damaged, but the framework of the central urban area survived. Topographically, some urban areas are located on a steep slope with no available flatland, and some are on a slightly gentler slope with potentially available flatland.

Particularly, in towns where tsunami waves destroyed the entire urban area, all wooden structures, except their foundations, were washed away, and everything, except reinforced concrete buildings and little debris, was gone from the port area. The devastation in these areas, compared with that sustained by the Sennan area, indicates a far more destructive tsunami surge (Photos 6 and 7). On the other hand, tsunami left a massive amount of debris in urban areas where the harbor and the surrounding neighborhood (mostly residential houses and seafood processing plants) were heavily damaged but the central urban area's framework survived (Photos 8 and 9). The differences in the level of destruction by tsunami waves suggest that the destructive force of tsunami may be mitigated by factors such as the direction of tsunami, the existence of an island or peninsula in front of the harbor entrance, the topography of an urban area and the presence of breakwaters, as

seen in cities such as Ofunato, Kamaishi and Kuji. The Kuji port was protected by three layers of defense: breakwaters at the bay entrance, further breakwaters and seawalls, limiting the extent of its damage to only the harbor area and flooding up to National Highway 45. In any case, there is a strong need for further surveys and studies.

In addition, large-scale fires broke out in the urban areas of cities such as Kesenuma, Rikuchuyamada-cho and Otsuchi-cho. The main source of those fires likely was the petroleum that leaked from the storage tanks in the port area that were washed away and became damaged when crushed by debris. The petroleum mixed with debris caught on fire when it came in contact with some sort of fire source, creating widespread fires in the urban areas. Some buildings survived structurally intact but showed signs of fire even though there was no evidence of fire in the surrounding neighborhood. This suggests that fire prevention in tsunami shelters is an issue that warrants study. The Sanriku region, which has been hit by quite a few tsunamis in the past, was well prepared for tsunamis before the disaster hit. Shelters were set up for potential tsunamis. Government offices, schools, hospitals and welfare facilities, among other public and utility buildings, were deliberately built on high grounds. Such buildings provided shelters for evacuees. Such efforts in preparing for potential disasters actually worked in this disaster despite the massive destruction. Nevertheless, some interviews have revealed that evacuees in some older urban areas had difficulty reaching the shelters on the neighboring hillside areas because of traffic congestion and other issues on streets that have not been adequately maintained for the purpose of evacuation. Each local area, thus, needs to determine where to set up its tsunami shelters and street networks that lead to these shelters according to the urban area's topography - which dictates where tsunami waves will inflict damage - and how the residents' will evacuate. In addition, some shelters

designated for tsunami evacuation were lost to the quake-triggered tsunami waves, and some shelters that protected the evacuees from tsunami waves had no stockpiles of provisions to support those who lost their homes. The capacity to accommodate and care for evacuees after a disaster is also one of the issues that need to be addressed.



Photo 6 Aerial view of the Shizunai district of Minamisanriku-cho



Photo 7 Devastation in the Shizunai district of Minamisanriku Town



Photo 8 Aerial view of the ravaged areas in Kesenuma City



Photo 9 Devastation in Kesenuma City

Summary: Characteristics of Damage

Tsunami waves were the chief cause of damage in this disaster. The damage was very widespread, covering prefectures from Aomori to Chiba. Mid- and small-size cities along the Pacific coast sustained catastrophic damage (75% of the tsunami-ravaged cities in the Tohoku region had a population of no more than 50,000, with most of them having a population size of between 10,000 and 30,000). Another characteristic is the very large number of cities that sustained damage.

The city of Ishinomaki in Miyagi Prefecture posted the highest number of dead and missing. The tsunami waves destroyed much of Ishinomaki-shi, including its harbor-area manufacturing facilities, its hinterland residential area and its central shipping district. The ratio of the number of victims to the pre-disaster population was the highest in Rikuzentakada-shi, Otsuchi-cho and Onagawa-cho, among other municipalities. Tsunami waves reached an estimated 15 meters or higher in some areas. A large number of people remain unaccounted for at present. The large

number of missing, another characteristic of this disaster, is hampering efforts to remove the debris left by the disaster.

The Senan area, on the other hand, suffered no serious damage to its urban center, which is located relatively inland. However, its coastal plains, which consist of mostly farmlands and some residential housing, were heavily damaged. Given the varied situation across the ravaged urban areas, reconstruction plans must be drawn up individually for each area based on the damage sustained, natural conditions, industrial infrastructures and communities.

THE GREAT EAST JAPAN EARTHQUAKE: FEATURES OF THE DAMAGE AND RECONSTRUCTION EFFORTS

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Features of the Damage

(1) Summary

At around 2:46 p.m. on March 11, 2011, the Great East Japan Earthquake occurred off the coast of the Sanriku area (38.1 degrees north latitude, 142.9 degrees east longitude, about 130 km east-southeast of the Oshika Peninsula), with an epicenter depth of about 24 km. The scale of the earthquake was as huge as a moment magnitude of MW 9.0, as estimated by the Japan Meteorological Agency. The size of

the fault is estimated to be about 450 km in length and about 200 km in width, and the slip on the fault is estimated to have been up to about 20 to 30 m.

Because of the earthquake, strong shaking was observed in a wide area. For example, a strength of 7 on the Japanese seismic scale was registered in Kurihara City in Miyagi Prefecture, and a strength of over 6 was registered in Miyagi, Fukushima, Ibaraki, and Tochigi prefectures. A high tsunami was also observed, and it caused extensive

damage along the coast of the Pacific Ocean, especially in the area from the Tohoku District to the Kanto District. In addition, the Fukushima Daiichi Nuclear Power Plant lost the cooling functions of its nuclear reactors, causing a serious accident involving spills of large quantities of radioactive materials.

For the disasters caused by the earthquake, including the nuclear power plant accident, the government made a Cabinet decision on April 1, 2011, to call it the Great East Japan Earthquake.

In the Great East Japan Earthquake, an area of 561 km², about nine times larger than the land inside Tokyo's Yamanote loop rail line, was flooded due to the tsunami caused by the earthquake¹⁾. In many municipalities in Miyagi Prefecture, including Iwanuma City, more than 50 percent of the inhabitable land area was flooded. In municipalities like Minamisanriku Town, the population in the flooded area accounted for over 80 percent of the total population (fig. 1). In coastal and plains areas on the Sendai Plain, the area below sea level was expanded from 3 km² before the earthquake to 16 km² afterward²⁾.

On March 23 the Cabinet Office estimated that the resources directly damaged by the Great East Japan Earthquake, including social capital, housing, and private sector facilities, amounts to 16 trillion to 25 trillion yen, significantly greater than the 10 trillion yen in damages in the Great Hanshin-Awaji Earthquake³⁾.

(2) Casualties and Evacuation

People killed directly due to the earthquake have been confirmed in 13 prefectures from Hokkaido to Kanagawa⁴⁾. As of May 11, two months after the earthquake, the number of deaths stood at 14,807, of which 2,170 people have yet to be identified, and the number of individuals missing is 9,969 (Table 1). In particular, damage in Miyagi, Iwate, and Fukushima prefectures was extremely heavy. Because the activity of searching

for the missing is not progressing in areas around the Fukushima Daiichi Nuclear Plant, the percentage of people missing is very high in some municipalities, such as Namie Town.

The National Police Agency announced a breakdown of the victims found in Iwate, Miyagi, and Fukushima prefectures as of April 19. By age, victims older than age 60 account for 65 percent (excluding people of unknown age), and the percentage of elderly victims is high compared with the proportion of elderly people in the population of coastal municipalities. For the cause of death, drowning accounted for 92 percent, suggesting that many elderly people failed to escape the tsunami and fell victim to it. This figure is as high as 96 percent in Miyagi Prefecture. Victims who were crushed or suffocated, which accounted for more than 80 percent of the victims of the Great Hanshin-Awaji Earthquake, accounted for 4 percent.

The number of evacuees reported as of May 11 is 115,098, from 18 prefectures, which is slightly decreasing after its peak⁵⁾. However, regarding the number of evacuees in places other than evacuation shelters (living in their homes or friends' homes), the government has little information. In addition, the number of evacuees and the locations where they will evacuate to are expected to change due to the second evacuation. By prefecture, evacuees to Iwate, Miyagi, and Fukushima prefectures account for about 80 percent of all evacuees (94,199

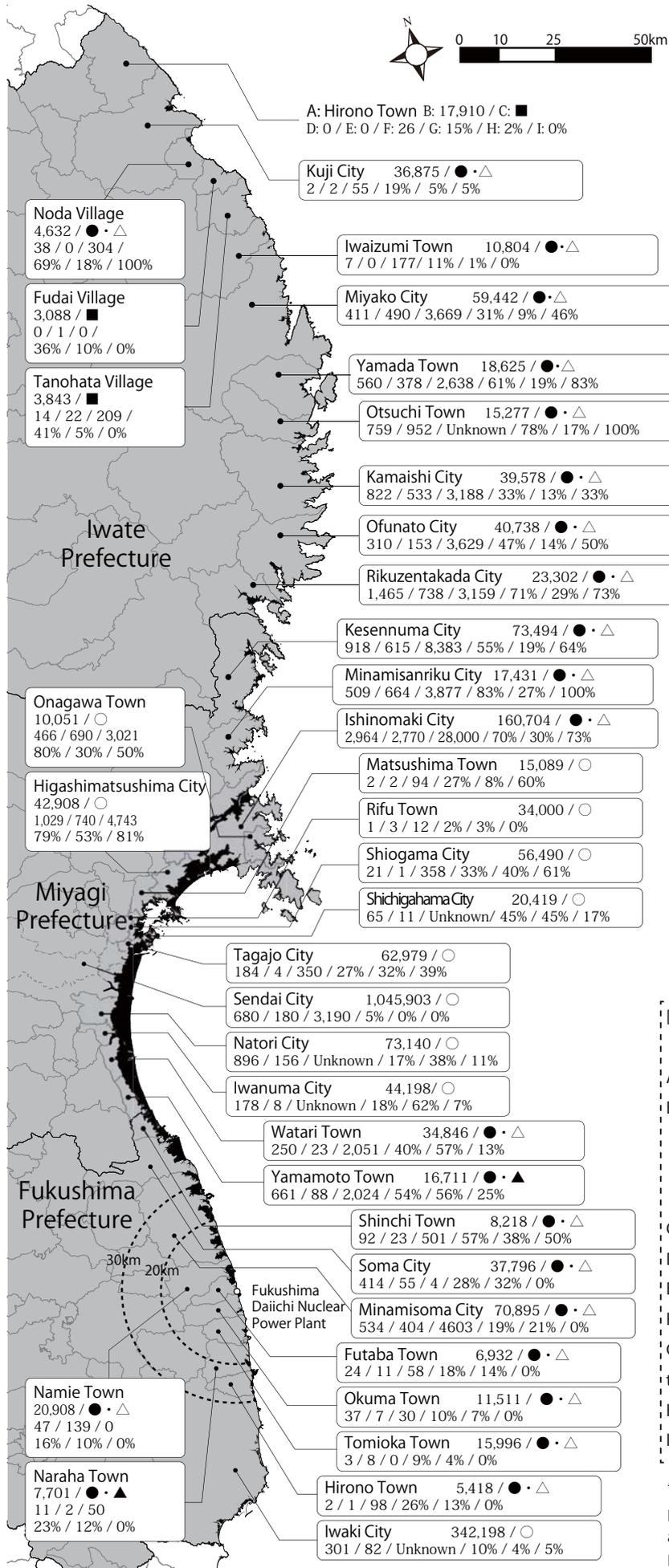
people). In addition to these three prefectures, Saitama, Niigata, and Gunma prefectures accepted many evacuees. In these prefectures, there are many people who evacuated from Fukushima Prefecture because of the nuclear plant accident.

The government's actions in response to the nuclear accident, such as evacuation instructions, is as follows⁶⁾: In accordance with the provisions of the Nuclear Disaster Special Measures Act, the government issued an evacuation instruction to residents within a radius of 3 km of the Fukushima Daiichi Nuclear Power Plant and a "stay indoors" instruction to residents within a radius of 3 to 10 km. On the night of March 12, the government extended the range of the evacuation instruction to the area within a radius of 20 km of the plant in response to the explosion in Unit 1. In addition, in response to the explosion in Unit 3 on March 14, the government issued a "stay indoors" instruction to residents within a radius of 20 to 30 km of the plant on the morning of March 15.

On April 21, the government specified the area within a radius of 20 km of the plant as a "caution zone" in accordance with the Disaster Countermeasures Basic Act and declared it a restricted area. In addition, on April 22, the government specified areas with high cumulative radiation doses that are farther than the 20-km-radius zone as a "planned evacuation zone" and urged residents in this area to evacuate to another location within about one month. At the same time, for areas other than the planned evacuation zone within a radius of 20 to 30 km, the "stay indoors" instruction was lifted, and this area was specified the "emergency evacuation-ready zone" instead. Residents in this area are required to prepare to shelter indoors or to evacuate on their own in case of emergency.

Table 1. Numbers of casualties, housing damage, and evacuees by prefecture^{4), 5)}

Prefecture	casualties (number of people)		Housing damage (number of units)			Evacuees
	Dead	Missing	Complete Destruction	Partial Destruction	Minor Damage	
Miyagi	8,837	5,963	56,718	12,285	14,012	33,207
Fukushima	1,501	733	7,275	5,615	42,424	24,498
Ibaraki	23	1	1,441	6,897	107,274	330
Chiba	19	2	691	2,283	19,962	1,119
Other	23	1	569	2,777	79,196	19,450



(3) Housing Damage, Liquefaction and Fire

Housing damage: For housing damage that was confirmed as of May 11, there were 83,794 houses completely destroyed, 32,426 houses partially destroyed, and 264,128 houses damaged. Many municipalities, such as Otsuchi Town, Natori City, and Iwanuma City, however, have yet to complete their investigations and cannot announce precise numbers. There are also many municipalities that cannot conduct detailed investigations because they are included in the caution zone around the Fukushima Daiichi Nuclear Power Plant, such as Futaba Town, Okuma Town, and Naraha Town. While damage from the tsunami is significantly large, structural damage due to shaking and the complete and partial destruction of houses due to fire are relatively low. Damage to nonresidential buildings is also great. In Otsuchi and Minamisanriku towns, all hospitals and clinics were in the flooded area. In response to such great tsunami damage, the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) decided to review building standards in the tsunami

[Legend]

- *see Hirono-cho at the top of map for location of A-I
- A: Name of municipality
- B: Total population (person)⁷⁾
 - Area division / ● Non area division
 - △ Use district / ▲ Non use district
 - Outside of city planning area
- C: City planning area status⁸⁾
- D: Number of fatalities (person)⁴⁾
- E: Number of missing (person)⁴⁾
- F: Number of houses totally destroyed⁴⁾
- G: Population living in flooded area⁹⁾ as percentage of total population
- H: Flooded area¹⁰⁾ as percentage of habitable area¹⁾
- I: Percentage of medical facilities in flooded area¹¹⁾

* Created by Hino using a map of flooding (as of April 18) provided by the Geospatial Information Authority of Japan and with the cooperation of Mr. Norimitsu Ishii of the Building Research Institute.

Figure 1 Tsunami-caused Flooding in Iwate, Miyagi, and Fukushima Prefectures (black shaded area)

risk zone through the Building Standards Maintenance Promotion Program. In addition, the Natural Disaster Victims Relief Act was applied to the whole area of seven prefectures—Aomori, Iwate, Miyagi, Fukushima, Ibaraki, Tochigi, and Chiba—as well as some parts of Nagano and Niigata prefectures.

Liquefaction: There was damage to residential land due to liquefaction in Kitakami City in Iwate Prefecture, Tone and Itako towns in Ibaraki Prefecture, Kuki City in Saitama Prefecture, and 10 cities and six towns in Chiba Prefecture. On May 2 the Cabinet Office revised the criteria for damage certification related to soil damage so that grants are paid based on the Natural Disaster Victims Relief Act, and municipalities were notified of this decision¹²⁾. Because there are still many households that do not qualify to receive support even with this revision, the Government of Chiba Prefecture, where 12,000 households in 16 cities and towns sustained residential land damage, decided to incorporate its own support fund into its supplementary budget and to subsidize up to 1 million yen for households that require housing demolition and soil remediation¹³⁾.

Fire: The number of incidences of fire due to the earthquake is 344 nationwide as of May 11³⁾. By prefecture, the 194 fires in Miyagi are by far the largest number, followed by 37 fires in Ibaraki, 34 in Tokyo, and 26 in Iwate. It is noteworthy that the tsunami caused many fires in coastal areas, and the number of incidences of fire in Tokyo is relatively large, even though Tokyo is located far from the epicenter.

(4) Transportation

Roads: Fifteen expressways, 69 sections of directly controlled national roads, 102 sections of auxiliary national roads, and 536 sections of prefectural roads, including damage due to aftershocks

on April 7 and April 11, were closed to traffic¹⁴⁾. To access the Sanriku coastal area, seriously damaged by the tsunami, the government carried out Operation Comb. First, (1) the vertical axis lines of the Tohoku Expressway and Route 4 were secured as emergency transportation routes; and then (2) the horizontal lines from the Tohoku Expressway and Route 4 to coastal areas were secured (11 routes were secured on March 12, and 15 routes on March 15). In parallel with the above operations, (3) an effort to open Route 45 along the Pacific Ocean was made. Because 97 percent of the route was open to traffic on March 18, the government completed Operation Comb and moved on to the emergency restoration step. Such quick restoration of routes was attributable to antiseismic reinforcement measures after the Great Hanshin-Awaji Earthquake as well as the cooperation of local construction businesses based on the disaster agreement¹⁵⁾.

For other routes, the Sanriku Longitudinal Expressway, a route that detours the areas flooded by the tsunami, was mostly undamaged and played an important role as a detour or emergency transportation road. On the other hand, the Hokuriku Expressway, Kanetsu Expressway, and directly controlled national roads on the Japan Sea side of the region played an important role as detour routes.

Railways: Many railways, including those in the Tokyo metropolitan area, were affected. Even on April 11, one month after the primary earthquake, all or part of 22 rail lines run by seven operators, including the Tohoku Shinkansen line, were out of service (excluding the stoppage due to the earthquake on April 7). Although the entire Tohoku Shinkansen line was reopened on April 29, there was no prospect for resumption of service as of May 10 for parts of seven lines run by JR East, part of Sanriku

Railway's North Riasu Line, and Sanriku Railway's entire South Riasu Line.

Aviation: Sendai Airport was severely damaged by the tsunami; the roof of Hanamaki Airport's terminal building collapsed, but operations resumed on March 16; and Ibaraki Airport's operations resumed on March 14. Regular flights were stopped for all three airports. At Sendai Airport, interim use of the runway for rescue planes became possible on March 16 as a result of recovery efforts. Commercial flights resumed on April 13. The government decided to operate Hanamaki Airport, Yamagata Airport, and Fukushima Airport on a 24-hour basis for relief efforts in the affected area.

(5) Electricity, Gas, and Water Supplies

Electricity¹⁶⁾ : Immediately after the earthquake occurred, there was a blackout in 4.86 million households, including all areas of Iwate, Akita, and Miyagi prefectures, almost all areas of Aomori and Yamagata prefectures, and part of Nakadori and Hamadori in Fukushima Prefecture, within the Tohoku Electric Power Company's service area. In the Tokyo Electric Power Company (TEPCO) service area, there was a blackout in a total of 4.05 million households, including all areas of Ibaraki Prefecture and part of the Kanto District. After that, in TEPCO's service area, electricity was restored in all regions by March 19. In the Tohoku Electric Power Company's service area, the number of households without electricity was reduced to 160,000 by April 6. However, immediately after the aftershock on April 7, there was a blackout again in about 3.92 million households, including all areas of Aomori, Iwate, and Akita prefectures and parts of Miyagi, Yamagata, and Fukushima prefectures. As of May 6, the number of households without electricity was reduced to 6,000, and almost all electricity has been restored.

Because of power shortages due to the shutdown of many power plants, scheduled rolling blackouts started on March 14. For scheduled blackouts, TEPCO's service area was divided into several groups, and the supply of electricity to these groups was stopped for a certain period of time by rotation. On April 8 and afterward, TEPCO stopped scheduled blackouts in principle because the balance of demand and supply had improved, and immediate shortages of electricity are expected to be avoidable.

Communication¹⁷⁾: Immediately after the earthquake, about 1 million landlines of NTT's telephone service and about 14,800 stations of four cellular telephone service carriers were down at the peak. By the end of April, the NTT landline telephone switching station and the mobile-phone calling area were restored, except for a few areas. As of May 19 the numbers of nonfunctioning landlines and cellular base stations was reduced to 12,000 landlines and 481 base stations.

Broadcasting¹⁷⁾: Immediately after the earthquake, up to 120 television relay stations and up to four radio relay stations stopped broadcasting.

Gas: Although about 500,000 households suffered shutdowns of natural gas service immediately after the earthquake, the number was reduced to 180,000, including households where the destruction of houses has been confirmed, as of April 10, one month after the earthquake. By May 3, the supply of natural gas was restored in about 420,000 households, excluding the area where houses were washed away¹⁸⁾. The number of households for which the supply of propane gas remains suspended is about 1.66 million in three prefectures in the Tohoku District as of March 11¹⁷⁾.

Water supply¹⁷⁾: Suspension of the water supply by water-supply corporations occurred in 19 prefectures. Immediately after the earthquake, on March 16,

suspension of the water supply was confirmed in at least 1.8 million households, excluding those where service was restored. Up to 355 water trucks were dispatched from 456 water-supply corporations nationwide to provide emergency water supplies. At the end of March it was found that tap water in some metropolitan areas, including Tokyo, contained radioactive iodine with a concentration exceeding the provisional criteria for drinking water for babies. As a result, the demand for bottled water increased significantly, resulting in a shortage of bottled water²⁰⁾.

Sewerage¹⁹⁾: Immediately after the earthquake, 48 sewage treatment plants in the coastal areas of the Tohoku District and the Kanto District stopped operations due to damage to mechanical and electric facilities, mainly caused by the tsunami. As of May 10, there were 19 sewage treatment plants in Iwate, Miyagi, Fukushima, and Ibaraki prefectures that remained offline. Among them, sewage inflow was found at 10 plants, which are implementing simplified treatment as an emergency measure by establishing temporary settling basins and disinfecting the supernatant. Sections of sewer pipes totaling 946 km were damaged among the 66,013 km of sewer pipes in 135 municipalities, based on primary visual surveys. For the damaged portions, emergency action has been taken by installing temporary pipes and pumps.

Rural community sewerage²⁰⁾: In 11 prefectures—Aomori, Iwate, Miyagi, Akita, Yamagata, Fukushima, Ibaraki, Chiba, Tochigi, Niigata, and Nagano—689 rural community sewerage systems were damaged, and the damage amounted to 28.5 billion yen as of March 30.

(6) Rivers, Coasts and Erosion Control²¹⁾

Rivers: On rivers under national authority, dikes were washed out or destroyed in 25 locations in the area of the Tohoku

Regional Development Bureau, including 13 dikes in the Kitakami River System and nine in the Naruse River System. There was no destruction of dikes in the area of the Kanto Regional Development Bureau. In addition, damage by liquefaction occurred in 35 locations: 22 in the Tone River System and 12 in the Ara River System. For rivers under prefectural control, dikes were washed out or destroyed in 24 locations in Miyagi Prefecture and one location in Aomori Prefecture.

Coasts: Of the sea dikes extending over a distance of about 300 km in Iwate, Miyagi, and Fukushima prefectures, a section of about 190 km was totally or partially destroyed. A wide area in the Pacific Ocean coastal area was flooded. The volume of flooding reached 112 million m³ on March 13. After that, the volume of flooding was reduced to about 9 million m³ (8 percent of the March 13 volume) on April 14 due to emergency drainage measures²²⁾. The areas in which sea dikes were seriously damaged are included in these flooded areas.

Erosion control: 12 debris flows (three locations each in Nagano and Niigata prefectures), 27 landslides (12 locations in Niigata and six in Fukushima), 72 cliff failures (22 locations in Ibaraki and 18 in Fukushima), and two village avalanches (in Niigata Prefecture) occurred with a total of 19 deaths and the complete destruction of 24 houses.

(7) Agriculture and Forestry^{20), 23)}

Agriculture: About 2.4 million ha of farmlands were flooded in Iwate, Miyagi, and Fukushima prefectures, and some areas were damaged by seawater. There were 2,062 farms and 10,546 agricultural facilities damaged in 16 prefectures ranging from Aomori to Mie, and the damage amounted to 375.5 billion yen for farms and 305.1 billion yen for agricultural facilities as of May 11. Damage to crops

extended over 13 prefectures, amounting to 11.7 billion yen for crops and livestock and 37.8 billion yen for agricultural and livestock-related facilities as of May 11.

Forestry and timber industry: The major disaster-affected prefectures are Miyagi, Ibaraki, Iwate, Fukushima, and Nagano prefectures. Known damage as of May 11 amounts to 105.8 billion yen. The breakdown of the amount of damage is 31.4 billion yen for forest devastation (412 locations), 19.3 billion yen for forestry conservation facilities (152 locations), 2.3 billion yen for forest roads and facilities (1,577 locations), 0.8 billion yen for forest damage (845 ha), 50.6 billion yen for wood-processing and distribution facilities (71 locations), and 1.3 billion yen for special forest products facilities (396 locations). Among wood-processing plants, plywood plants in Iwate and Miyagi prefectures, which account for about 30 percent of domestic plywood production, were damaged.

Effects of the nuclear accident: Because of the nuclear accident, radioactive material exceeding the provisional regulation values was detected in some crops. Restriction of distribution and/or consumption has been implemented for spinach and kakina (a leafy vegetable) grown in some municipalities of Fukushima, Ibaraki, Tochigi, and Chiba prefectures as of April 11. For crops grown near the nuclear plant, there are cases where shipping is restricted in the wholesale stage, or consumers refrain from buying the products due to harmful rumors or misinformation, even if restrictions on their distribution or consumption have not been implemented.

(8) Fisheries^{20), 23)}

The earthquake inflicted heavy damage on a wide area, including seven prefectures (Hokkaido, Aomori, Iwate, Miyagi, Fukushima, Ibaraki, and

Chiba) that account for 50 percent of Japan's fishery yield and one-third of its fishermen. Damage in Iwate, Miyagi, and Fukushima prefectures was particularly catastrophic, affecting the stable supply of seafood.

Fishing boats: Damage was confirmed in 19 prefectures, from Hokkaido to Kagoshima. As of May 11, the number of damaged fishing boats stood at 20,718, with the damage amounting to 138.4 billion yen. Damage in Iwate and Miyagi prefectures was particularly devastating.

Fishing ports: Damage was confirmed in seven prefectures, ranging from Hokkaido to Chiba. The number of damaged ports as of May 11 is 319, with the damage amounting to 411.9 billion yen. The damage is particularly serious in Iwate, Miyagi, and Fukushima prefectures, and almost all areas in these prefectures sustained devastating damage.

Aquaculture facilities: Damage was confirmed in 15 prefectures ranging from Hokkaido to Okinawa. The damage as of May 11 amounts to 46.4 billion yen for aquaculture facilities and 54.4 billion yen for cultured fish.

Markets and freight handling areas: Damage was confirmed in seven prefectures ranging from Hokkaido to Chiba. As of May 11, almost all of the 105 markets were damaged, 25 markets were severely damaged or completely destroyed, and 11 markets were partially destroyed or had buildings that were washed out. Damage in Iwate, Miyagi, and Fukushima prefectures was particularly devastating.

Seafood processing facilities: Because many seafood processing facilities are operated by small or medium-scale companies, it is difficult to ascertain the features of the damage. As of May 11, of the total 2,108 processing plants, it is reported that 394 plants were completely destroyed, 101 plants were partially destroyed, and 114 plants were flooded.

Because full details of the damage in Fukushima Prefecture are not yet known, the number of damaged processing plants is expected to increase significantly.

Effects of the nuclear accident: In Fukushima Prefecture, the Fukushima Fisheries Cooperatives voluntarily refrained from operation. In addition, the Government of Ibaraki Prefecture requested the Ibaraki Fisheries Cooperatives to refrain from operation in response to the detection of radioactive material exceeding the provisional regulation value from sand eels in the northern part of Ibaraki Prefecture as of April 11. Like crops, seafood has also sustained financial damage from harmful rumors and misinformation.

(9) Mining and Manufacturing²⁰⁾

Automotives: Automotive parts manufacturers in the Tohoku District suffered quake damage. As a result, automobile production shrunk or was stopped on the national scale, and automobile production at overseas plants was also affected. As of April 11, there is a trend of restarting manufacture of manufacturable vehicle models while adjusting the pace of operations.

Electricity: Many semiconductor and electronic component manufactures stopped production. In some plants for microcomputers, silicon wafers, and lithium ion batteries with a large global market share, there is a delay in the resumption of manufacturing (as of April 11).

Nonferrous metals: Although about 25 percent of the production capacity of wire was stopped due to the impact of the earthquake, almost all plants will restart production in April or May (as of April 11).

Chemicals: After the earthquake, three chemical plants in the affected area stopped production. However, two of the three have resumed production as of April 4.

Cement: The tsunami inflicted serious damage on the largest cement plant in the Tohoku District, located in the coastal area of Ofunato City in Iwate Prefecture.

Paper: The tsunami inflicted devastating damage on major paper mills in Hachinohe City in Aomori Prefecture and Ishinomaki City in Miyagi Prefecture.

Shipbuilding: The tsunami inflicted devastating damage to almost all shipbuilding plants in Aomori, Iwate, Miyagi, and Fukushima prefectures.

Food: The supply of food-packaging materials has not caught up with demand due to damage to manufacturers; this has had an impact on the food industry in general for products such as natto, milk, dairy products, and beverages.

(10) Distribution and Service

Industries^{17), 20)}: Wholesale markets and logistics distribution centers:

89 wholesale markets were affected. In addition, gasoline stockpiles were reduced significantly due to the insufficient supply of gasoline immediately after the earthquake. Because logistics distribution centers were damaged, delays in distribution occurred. As of April 11, about 70 percent of the wholesale logistics centers for major processed food in Miyagi Prefecture are closed.

Stores: Immediately after the earthquake, over 40 percent of major convenience stores in the affected area and about 30 percent of the major supermarkets were closed. As of March 29, about 90 percent and 80 percent, respectively, were open.

Gas stations: Six of the nine refineries in the Tohoku District and the Kanto District were damaged. Sluggish distribution caused serious shortages of gasoline and light fuel oil in all areas in Tohoku and Kanto. Especially in Iwate, Miyagi, and Fukushima prefectures, the operating rate of gas stations dropped to 53 percent as of March 20.

Parcel delivery service: All services were stopped in all areas for about one week after the earthquake in three prefectures in the Tohoku District.

Postal service: At 583 post offices, accounting for about 53 percent of the 1,103 post offices in three prefectures in the Tohoku District, operations were stopped as of March 14, shortly after the earthquake. In 44 areas, accounting for about 15 percent of the 301 postal areas in three prefectures in the Tohoku District, delivery service could not be provided as of March 14, shortly after the earthquake. As of May 19, the post offices suspending operations were reduced to 94, and pickup and delivery operations had started in all regions except the six areas in the caution zone around the Fukushima Daiichi Nuclear Power Plant.

Finance: Of the total 2,700 operating branches of the 72 financial institutions that have head offices in six prefectures in the Tohoku District or Ibaraki Prefecture, about 280 branches (about 10 percent) were closed as of March 14, shortly after the earthquake. As of April 12, about 140 branches (about 5 percent) are closed.

Movement Toward Recovery and Reconstruction

(1) Reconstruction Design Council

On April 1, Prime Minister Naoto Kan referred to the relocation of tsunami-hit areas to higher ground and the idea of eco-towns utilizing biomass. On April 11, he established the Reconstruction Design Council with outside experts as an advisory body to the prime minister. Meetings were held 12 times in total, from the first meeting on April 14 through June 25. In the fourth meeting, on May 10, they announced “Seven Principles of Reconstruction Design” that referred to community-centered reconstruction and

construction of natural energy-powered regions. In the final meeting on June 25, they announced a recommendation titled “Toward Reconstruction—Hope Beyond the Disaster,” consisting of four chapters: (I) “A New Concept for Rebuilding the Region,” (II) “Restore Life and Livelihood,” (III) “A Word Toward Reconstruction after the Nuclear Accident,” and (IV) “Open Reconstruction.”

(2) Housing

On March 28, the Headquarters for Disaster Victims Livelihood Support established the Review Meeting on Promotion of Housing for Disaster Victims to sort out and consider various issues concerning quickly offering emergency temporary housing as well as the mid- and long-term supply of housing.

Utilization of public housing: On March 22, the Public Housing Information Center for Disaster Victims was established so that information on public housing available to disaster victims is provided in an integrated fashion so that disaster victims can apply for housing more smoothly. When this information center was established, it handled only public housing and Urban Renaissance Agency’s rental housing, but on March 28 and after, it also handled private rental housing and housing for national government workers. As of June 29, there are 35,072 housing units for government workers throughout Japan that can accept disaster victims (of which 7,218 units have already been provided) and 23,358 public housing units that can accept disaster victims (of which 6,010 units have already been provided²⁴⁾). These housing units are located all over Japan, and Osaka, Tokyo, Hyogo, and Hokkaido prefectures are providing many of the housing units.

Emergency temporary housing²⁵⁾: To accept secondary evacuees, there is a request to provide 51,315 emergency temporary housing units. On March

14 the minister of Land, Infrastructure, Transport, and Tourism requested the Japan Federation of Housing organization to supply 30,000 housing units in another two months, and on April 5 requested an additional 30,000 housing units in about three months. Though there are cases where houses could not be constructed as scheduled due to the lack of land and housing-related materials, construction of 46,007 housing units was started (of which construction of 35,202 housing units was completed) in 781 districts, equivalent to 90 percent of the quantity requested (Table 2). The Government of Fukushima Prefecture decided to use local contractors for the construction of 4,000 temporary housing units by public bids in order to take advantage of materials and companies in Fukushima Prefecture. For emergency temporary housing that the government provides by renting private rental housing, tenants have already been determined for 31,811 units.

(3) Special Act on Building Restriction

On April 8, the Government of Miyagi Prefecture specified a restricted construction area under Article 84 of the Building Standards Act in order to prevent the disorderly construction of buildings in affected areas. Although the period of construction restriction is two months from the date of the occurrence of the disaster at the longest, the Act on Special Measures Concerning Building Restrictions of Urban Districts Damaged

by Great East Japan Earthquake was promulgated and went into effect on April 29. As a result, it became possible to restrict construction for up to eight months. In response to the Act on Special Measures, the Government of Miyagi Prefecture extended the building restriction period to September 11.

On April 29, the Cabinet Office accepted a Disaster Recovery Work Proxy Bill, which allows the central government to perform infrastructure recovery work directly on behalf of the affected municipalities.

(4) Measures Taken by the Central Government at the Recovery Stage²⁶⁾

On May 20, the central government's headquarters for emergency disaster control prepared "Measures to Be Taken by the Central Government for the Upcoming Three Months Until Full Reconstruction Starts." A summary of these measures:

(a) Improvement of living conditions at evacuation shelters

The government will improve the living environment of disaster victims living in evacuation shelters and their own houses.

To focus specifically on the improvement of evacuation shelters in significantly harsh environments, the government will provide support to prefectural and municipal governments, and it will provide information and conduct necessary consultations.

(b) Housing support

The government will promote the construction of emergency temporary housing and utilize housing for government workers, public housing, and private rental housing so that victims can move into emergency temporary housing as soon as possible. The government aims to abolish most of the evacuation shelters by mid-August and to provide emergency temporary housing to all victims who want to live in it.

(c) Securing services such as health, medical care, welfare, and education

To secure the quality and quantity of medical and other services, the government will utilize assistance from within and outside the affected area and recover damaged facilities while establishing temporary facilities. Toward normal education activities, the government will recover school facilities and provide support for affected children.

(d) Removal of debris

To return the negative conditions to a clean or "zero" state, the government will remove most of the disaster waste that is causing harm to the living environment by the end of August this year²⁷⁾.

(e) Emergency disaster prevention measures

By the early period of the rainy season (baiu) and the typhoon season, the government will implement required countermeasures against secondary disaster for each of these seasons. The government will also drain the areas that have been submerged by the tsunami and subsidence and take countermeasures against liquefaction.

(f) Recovery of lifelines, transportation networks, farms, and fishing ports

The government will promote the recovery of farmlands and fishing ports while continuing to make efforts toward quick recovery of infrastructure, including lifeline utilities and traffic networks in areas where houses were washed away.

Table 2. State of emergency temporary housing by prefecture

Prefecture	Number of units demanded	Under construction		Number of completed units
		Number of Districts	Number of units	
Iwate	14,000	312	13,824	10,310
Miyagi	23,000	313	18,666	15,136
Fukushima	14,000	148	13,202	9,441
Ibaraki	10	2	10	10
Tochigi	20	1	20	20
Chiba	230	3	230	230
Nagano	55	2	55	55
Total	51,315	781	46,007	35,202

The government will conduct research and analysis of disaster features for all the flooded areas and provide support to the efforts of local governments.

(g) Toward rebuilding livelihoods

The government will establish a beachhead for the reconstruction of the local economy by creating jobs with reconstruction work, providing support for new employment, supporting the effort to maintain employment by affected companies, and supporting companies for the resumption of business.

(5) MLIT's Measures Toward Recovery and Reconstruction²⁸⁾

As measures to shift from emergency recovery to full-scale recovery and reconstruction, on June 14 MLIT announced four basic policies: (I) livelihood rebuilding and stabilization of disaster victims, (II) postdisaster urban reconstruction planning from new ideas, (III) regeneration of local industry and economy as well as the urban traffic infrastructure supporting it, and (IV) reconstruction of the land with a disaster-resistant structure.

(I) Livelihood rebuilding and stabilization of disaster victims (harmonization between quick rebuilding of livelihoods and city planning that requires a lot of time)

The basic plans include (a) providing secure and safe housing in which people can live without fear, (b) providing consideration for elderly people and communities along with support for independent reconstruction, and (c) securing and maintaining public transportation in the region.

(II) Postdisaster urban reconstruction planning from new ideas (building secure and safe cities into which "hard" and "soft" measures are integrated)

The basic plans include (a) construction of tsunami-resistant cities

into which "hard" and "soft" measures are integrated, (b) coordination for integrated land utilization of urban areas and farmlands from which vertically divided administration is eliminated, and (c) support for postdisaster urban reconstruction planning.

(III) Regeneration of local industry and economy as well as the urban traffic infrastructure supporting it (regeneration of industry in the Tohoku District directly associated with the regeneration of the Japanese economy and maintenance of international competitiveness)

The basic plans include (a) quick recovery of transportation infrastructure that supports the regeneration of industry and the economy, (b) upgrading urban transportation infrastructure that supports the reconstruction of regions, and (c) aggressive implementation of tourism promotion measures such as the recovery of tourism demand both in Japan and abroad.

(IV) Reconstruction of the land with a disaster-resistant structure

The basic plans include (a) reconstruction of the land with a disaster-resistant land structure—reinforcing individual facilities and regions: upgrading the land infrastructure to increase resistance to disasters, and providing for disasters with systems: formation of resilient land that is resistant to disasters; and (b) examination of land policy from a broader perspective.

(6) Basic Act for Recovery

The Basic Act for Recovery from the Great East Japan Earthquake was promulgated and went into effect on June 24. As its basic principle, the law declares that Japan will go beyond restoration of the predisaster conditions in the devastated areas and will perform reconstruction aimed at the desirable future direction of Japan in the middle of the 21st century. As its basic measures, it stipulates the

issuance of reconstruction bonds to fund reconstruction efforts and the establishment of a reconstruction special-zone system, in which special regulatory measures are applied to the specified zone.

This law also stipulates the establishment of the Headquarters for Reconstruction from the East Japan Great Earthquake, with the Prime Minister as its head, and the establishment of local headquarters. In this law, the previously described Reconstruction Design Council is positioned as the advisory board for the headquarters for reconstruction.

In addition, the law stipulates the establishment of the Reconstruction Agency, which will take charge of planning, proposals, and overall coordination for measures for reconstruction from the Great East Japan Earthquake in an integrated fashion only for a specified period²⁹⁾.

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A REPORT ON APPROACHES AND PROBLEMS OF POSTDISASTER RESTORATION PLANNING IN THE INITIAL STAGE

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Introduction

Restoration from an earthquake and tsunami can be divided into four fields: "life," "housing," "physical city," and "industry." While the debris removal work is still underway, making a reconstruction plan for a physical city is in progress. This paper will report on the state of the postdisaster restoration planning in the initial stage and add my insights based on listening to disaster victims, the City Planning Division of the Government of Iwate Prefecture, and the City and Housing Development Department of the Tohoku Regional Bureau of the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) carried out at the end of April; on-site inspections; and information obtained from announcements by public institutions.

Reconstruction Planning That Takes Damage Conditions into Account

Because of the damage to housing caused by the earthquake and tsunami, 31,000 people are living in evacuation shelters and 26,000 people are living in the homes of friends or relatives. Including people living in temporary emergency housing, a total of approximately 112,000 people are forced to continue living as evacuees⁽¹⁾

in uncomfortable environments. When asked about their future places of residence, many victims answer that they want to rebuild their livelihoods in their original locations, although there are also people who do not want to return to their original places. In affected areas with a lot of debris, I saw people who had resumed their business in temporary facilities as well as people who had begun to rebuild their houses by putting up new pillars. Although it is rational to reconstruct and develop cities in parallel with the process

of rebuilding the livelihood of victims, planning and implementation are always destined to be behind the timing of the judgement or decisions of individuals.

Let me explain the state of the seriously damaged cities in Iwate and Miyagi prefectures. In municipalities that include Rikuzentakata City, Otsuchi Town, and Onagawa Town, where the estimated flooded area extended over a wide range of the urban districts, most of the urban functions were destroyed because buildings were mainly made of wood



Photo 1. Flooded urban area (Rikuzentakata City)



Photo 2. Quake- and tsunami-stricken city without identifiable traces (Otsuchi Town)



Photo 3. Damage to steel and reinforced concrete structures (coastal urban district of Kamaishi City)



Photo 4. Near the boundary of the quake- and tsunami-stricken area and outlying areas (a shopping avenue in Kamaishi City)

(Photos 1 and 2). As countermeasures against tsunamis in the future, there are discussions on the redeployment of trunk roads that have disaster-reduction functions, relocation of settlements to higher ground, and permanent building restrictions in disaster-risk areas. These plans imply that radical reconstruction of cities is required, and there is a possibility that the predisaster image of the city will have to be abolished.

On the other hand, in municipalities like Kamaishi City, the tsunami hit the coastal urban district and caused fatal damage to steel and reinforced concrete

structures, but the damage to outlying areas was limited to a little flooding. In such a town, the reconstruction plan should naturally be different from other seriously damaged towns. Such a town requires a hybrid type of urban reconstruction planning in which the coastal urban district (Photo 3) is radically reconstructed and the hinterland, with relatively little damage (Photo 4), is recovered and redeveloped.

Although the urban reconstruction plan differs depending on the features of the damage, as discussed above, certain phenomena are common to these

municipalities: a high rate of population decline (5 to 9 percent in five years) and a high percentage of aging population (around 30 percent) (Table 1). Because it is not unlikely that reconstruction will slow this trend, population decline and aging in these municipalities must be taken into account when making an urban reconstruction plan. It is necessary to develop a highly feasible city reconstruction plan while inspiring people's feelings for the reconstruction of sustainable cities in the affected area.

Next, let me explain the state of postdisaster restoration planning in the initial stage.

Efforts and Issues Related to Urban Reconstruction Planning

(1) Efforts in Miyagi Prefecture

Twenty-seven days after the disaster, on April 7, Miyagi Prefecture announced a support policy for making a draft of postdisaster urban reconstruction plan⁽²⁾. The policy shows rough planning of residential or commercial and industrial areas to be reestablished in affected areas while taking into account the intentions of municipalities on behalf of cities and towns that are hard-pressed to support the victims. The next day, the Government of Miyagi Prefecture enforced building regulations under Article 84 of the Building Standards Act in three cities and two towns. The "Basic Disaster Reconstruction Policy (Draft)" announced on May 11 states the orientation of reconstruction as follows: "...it is necessary for city and town governments to drastically reconsider the way they think in regard to long-term plans for residential areas, farming areas, fishing-port areas, port areas, and commercial areas and industrial areas, to create a new reconstruction model."

Table 1. Population decline and aging rates in flooded municipalities

		Population (2010)	Population of the estimated flooded area	Population increase-decrease rate (2005-2010)	Aging rate (2010)
Iwate Pref.	Miyako City	59,442	42.0%	-6.5%	30.4%
	Ofunato City	40,738	38.0%	-6.0%	30.9%
	Kuji City	36,875	2.5%	-5.8%	25.7%
	Rikuzentakata City	23,302	58.1%	-5.7%	33.5%
	Kamaishi City	39,578	23.6%	-7.9%	34.4%
	Otsuchi Town,	15,277	51.3%	-7.5%	31.6%
	Yamada Town	18,625	62.9%	-7.5%	31.2%
	Iwaizumi Town	10,804	11.2%	-9.3%	37.4%
	Tanohata Village	3,843	28.0%	-9.4%	32.4%
	Fudai Village	3,088	4.8%	-8.0%	31.2%
	Noda Village	4,632	43.6%	-7.7%	29.2%
	All Iwate Pref.	1,330,530	-	-3.9%	26.8%
Miyagi Pref.	Miyagino-ku	190,485	6.2%	4.3%	16.9%
	Wakabayashi-ku	132,191	6.6%	1.7%	18.7%
	Taihaku-ku	220,715	1.1%	-0.8%	20.0%
	Ishinomaki City	160,704	63.9%	-4.0%	26.8%
	Shiogama City	56,490	30.6%	-4.8%	26.7%
	Kesennuma City	73,494	40.3%	-5.8%	30.1%
	Natori City	73,140	16.6%	6.5%	19.0%
	Tagajo City	62,979	21.7%	0.4%	18.1%
	Iwanuma City	44,198	16.5%	0.6%	19.4%
	Higashimatsushima City	42,908	76.9%	-0.8%	22.6%
	Watari Town	34,846	37.8%	-0.8%	22.8%
	Yamamoto Town	16,711	55.9%	-5.7%	30.8%
	Matsushima Town	15,089	12.9%	-6.8%	30.1%
	Shichigahama Town	20,419	46.2%	-3.1%	21.4%
	Rif Town	34,000	0.7%	5.4%	15.4%
	Onagawa Town	10,051	87.7%	-6.3%	33.7%
Minamisanriku Town	17,431	76.3%	-6.5%	29.3%	
All Miyagi Pref.	2,347,975	-	-0.5%	22.2%	
All Japan		128,056,026	-	0.2%	22.7%

■ indicates areas where at least 50% of the population is living in areas that are expected to be flooded.

Based on processed data from the Statistics Bureau of the Ministry of Internal Affairs and Communications. (<http://www.stat.go.jp/info/shinsai/index.htm>)

This policy lays out concrete contents such as support of the implementation of reconstruction plans of affected municipalities under the initiative of the prefecture. The Government of Miyagi Prefecture stated that the prefectural government was planning to prepare the plan by September and announced a draft of the secondary reconstruction plan on July 6.

Of the municipalities in the prefecture, Sendai City announced its “Basic Disaster Reconstruction Policy” on April 1. It demonstrated the concept of reconstruction as well as the orientation of immediate measures, such as total care for victims, quick recovery of lifelines, and stable supply of life services. Higashimatsushima City also announced “Guidelines for Recovery and Reconstruction,” and Kesenuma and Ishinomaki cities showed their intention to be specified as recovery-promotion areas based on the Act on Special Measures Concerning Disaster-stricken Urban District Reconstruction. In this stage, however, urban reconstruction policies announced by municipalities are still abstract, and concrete physical plans have not been presented. After that, municipalities examined various plans, such as zoning for land utilization and relocation of communities in units, and presented them to residents. However, no municipality could make a decision. These municipalities are in circumstances where they can not afford to establish a system for making plans because sufficient information on the actual disaster situation has not been collected, and the civil service is pressed to provide immediate support to victims. However, I consider that there are more fundamental problems in the procedure for planning and the locations of authorities and financial resources. This issue will be discussed later.

(2) Efforts in Iwate Prefecture

Iwate Prefecture announced the “Basic Policy for the Great East Japan Earthquake and Tsunami Reconstruction Efforts” on April 11 and demonstrated the urgent action that the prefectural government must take, along with a vision of reconstruction and a policy for creating a reconstruction plan. The points of discussion submitted to the first meeting of the Tohoku Earthquake and Tsunami Reconstruction Committee list the points to be considered in creating a reconstruction vision and suggest that it is necessary to present a variety of options as a guide to form a common ground that meets both the requirements of disaster prevention and community construction, depending on regional characteristics and features of the damage⁽³⁾. For the urban reconstruction plans of municipalities, the Government of Iwate Prefecture seems to provide support in response to requests from municipalities instead of taking the initiative on their reconstruction plan⁽⁴⁾. In this respect, the stance of the Government of Iwate Prefecture is somewhat different from that of Miyagi Prefecture. For the planning development schedule, the Government of Iwate Prefecture also announced that it would prepare a plan by September, like Miyagi Prefecture. On June 7, the Government of Iwate Prefecture announced the “Earthquake and Tsunami Reconstruction Basic Plan (Draft).” After that, the government invited the public to offer their opinions and held an explanatory meeting in affected areas.

As a characteristic movement of municipalities, Ofunato City, which is not a specific administrative agency, requested temporary building restrictions in the affected urban area on April 10. Though it does not have compelling force because the measures are not required by law, the attitude of the city and the aim of its announcement can be evaluated highly as the city’s voluntary efforts.

(3) Issues on the formation of an urban reconstruction plan with a focus on the initial stage

[Disaster Victims]

For disaster victims, the pressing issues are the improvement of or departure from their current life of evacuation and rebuilding their livelihood in the future. To decide where to rebuild their houses in such circumstances, information on the urban reconstruction plan is essential. For victims in cities where the entire urban district sustained devastating damage, in particular, the situation is more serious because substantial constraints are expected to be imposed in the selection of their residences. In addition, the schedule clarifying when they can rebuild their houses is an essential element in determining their actions in the future. Without these information, there is no choice but to fall into the moratorium of stopped thinking. Because victims think from the standpoint of individuals trying to reconstruct their livelihoods, the interest of victims in the urban reconstruction plan is focused on what compensation is provided for land and houses at the time of relocation and what support is provided when rebuilding their houses. They are inevitably passive toward the overall vision of urban redevelopment and the reconstruction schedule. Therefore, victims’ involvement in immediate reconstruction planning does not easily lead to “planning requirements” but is mainly focused on the “life requirements” such as housing reconstruction.

[Municipalities]

In cities that suffered devastating damage, the urban structure that had been formulated or targeted will be radically changed. In this case, apart from the whereabouts of the basic decision-making authority, the action of planning the land use policy, which is

essential to the reconstruction of housing and commercial facilities, is naturally different from that before the disaster. This is because the placement of key urban facilities, the financial measures to be taken, the way of doing business, and the method of adjustment become more and more variable and fluctuating. Until now, the existing land use and key urban facilities were regarded as stable elements, the target urban structure was laid out based on them, and plans for upgrading, development, and maintenance accumulated and were implemented. This was so-called progressive planning. However, as a result of the collapse of stability and

accumulation, it became necessary to take radical planning action in which urban facilities and the land use are determined in an integrated manner.

However, as the statement “roads, bridges, and rivers are the roots; waterworks, housing, and sewerage are branches⁽⁵⁾” indicates, we cannot ignore the steps that should be taken to make the plan because the plan for basic facilities must be determined before the plan for associated facilities can be determined. For example, National Route 45 played a role as the main trunk for logistics in the vertical direction for affected cities, and land has been used based on it. Because regional

high-standard highways constructed on embankments acted to reduce damage from the tsunami this time, there is discussion on active utilization and improvement of their damage-reduction function by changing the lines and structure of highways. However, municipalities cannot determine the plan of urban facilities in such a wide area ahead of the national government. Desirable action for municipalities is to draw an image of the reconstructed cities themselves in which local characteristics are reflected, as well as to consider various options such as the strengthening of breakwaters and seawalls, expansion of green spaces in the coastal area,

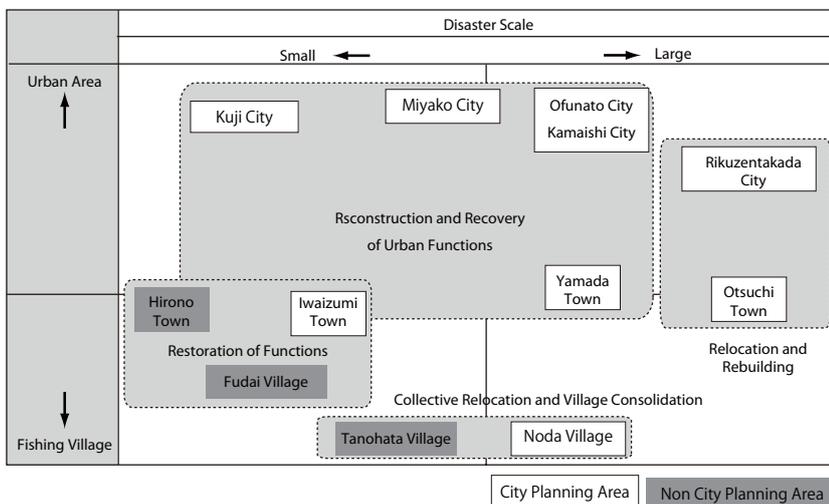
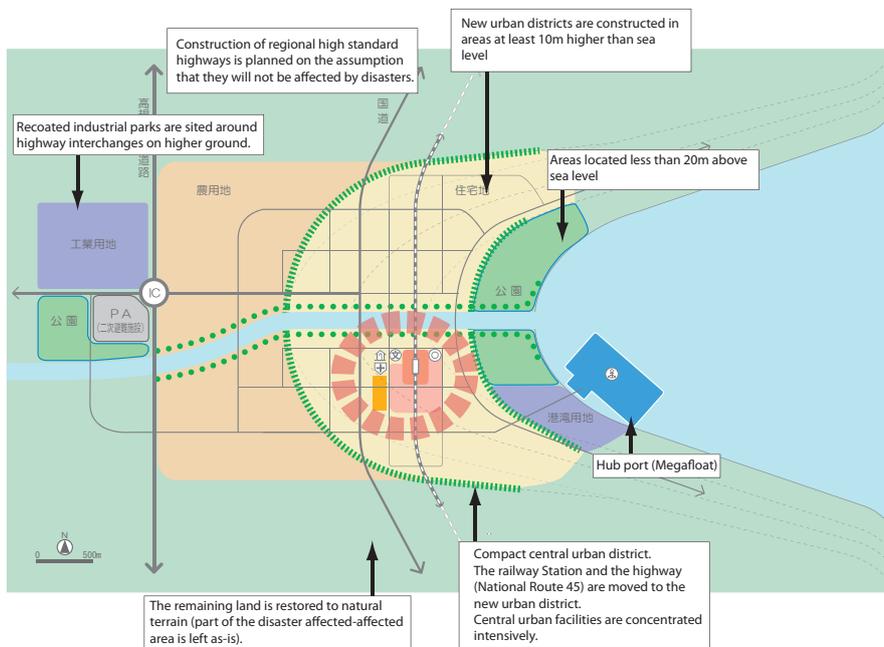


Figure 1. Example of examination of the image of reconstructed cities
—Created by Nippon Engineering Consultants Co. Ltd., April 12, 2011

relocation of residential areas to higher ground, use of artificial ground in urban areas, and regulation of the permanent use of building sites and to determine their combinations and concrete spacial placement. However, such measures could end up as pie in the sky unless the business system is amended or a financing system is determined that differs from that in use during ordinary times.

As long as it is difficult to set a framework for planning, municipalities cannot determine concrete urban reconstruction plans in advance, although they can present their images. Even if they determine concrete measures for the use of land and buildings at the district level to meet the needs of victims, there is a strong possibility of the occurrence of rework as long as the fundamental facilities that are the framework of the city are not determined. The action to be taken by a municipality for the time being is to promote its intentions extensively in order to hasten various elements of required coordination and to envision several images of the desirable reconstructed city together with some case studies that assume points of compromise for various uncertainties. Narrowing to one plan is not appropriate at this stage.

To form consensus with residents on the image of reconstructed cities, the municipal government should provide residents with information on the basic orientation and process of the plan by using the public involvement method and trying to understand the awareness and intentions of the residents in order to reflect their "life requirements," explained above, on the image of the reconstructed city⁽⁶⁾. At the district level, the action of enhancing "life requirements" to "planning requirements" is important. In this regard, at the hearings of the Tohoku Regional Bureau of MLIT, they make a comment

placing importance on consensus formation by saying, "When making a reconstruction plan, it is important to have residents consider that it is not a plan created by an external body but the plan of the residents themselves."

[Planning Technique]

Related to planning in circumstances where there are many uncertainties, Professor Yuko Fujigaki (2003), specializing in science and technology studies, explains that scientific rationality does not necessarily match social rationality. She points out that "we must bear in mind that waiting for reliable results will result in the failure to come up with effective measures." Her statement refers to "a problem that requires social consensus 'now,' although even scientists cannot answer because it contains many uncertain factors" in decision-making about public space. Her statement is also synchronous with the issue of making an urban reconstruction plan.

In terms of planning techniques in response to this issue, the two-stage urban planning decision method, which was adopted by Hyogo Prefecture after the Great Hanshin-Awaji Earthquake, may provide some hints. In this method, the process is divided into a framework and details when determining postdisaster urban reconstruction planning. To determine the framework in an early stage in the event of an emergency, the decision in the first stage handles only the type of implementation measures and the project areas. Based on the decision, the second stage secures the citizen participation that is not sufficiently secured in the first stage when discussing the details of the plan. In this method, it becomes necessary to guarantee the retroactivity and reversibility against the decisions of the first stage, depending on the results of examination in the first stage, because there are close

relationships between the framework and details of planning. However, previous studies point out that they were not guaranteed in the Great Hanshin-Awaji Earthquake (Shiozaki 1998). In light of this lesson, if the problem of differences in decision-makers depending on the planning target or changes in the legal framework and financing are unavoidable, it will be necessary to handle decisions on the urban reconstruction plan in a step-by-step manner and to allow flexibility in the planning so that the decision can be changed depending on the results of examination in the later stage.

[Building Regulations]

In severely affected areas, lifelines such as electricity, gas, and water supplies along with sewerage systems have not yet been recovered. At this point, there are few construction activities in places where no plan has been made. However, quick recovery of infrastructure is clearly declared in the reconstruction policy of the prefectural and city governments. After the infrastructure is gradually restored, reconstruction activities on housing and facilities would become conspicuous. As discussed above, it takes a relatively long time to determine the urban reconstruction plan in seriously damaged municipalities, and it takes substantial additional time to determine the district level plan. From the standpoint of securing the time to form the consensus required for planning surface readjustment and the rationality of development investment by the private sector and the administration, how to control the occurrence of construction activity in this period is also a task at hand.

Building regulations related to the reconstruction of affected urban districts include emergency evacuation regulations, regulations on securing a planning period, business mortgage

regulations, and land use regulations⁽⁷⁾. To control the occurrence of building activity that causes new constraints in making a postdisaster urban reconstruction plan, it is important to regulate construction by specifying “urban disaster recovery promotion areas” that fall under regulations on securing a planning period. However, in this specification, reconstruction of wooden houses with lot areas of less than 300 m² is not regulated. Therefore, this specification is not sufficient to control construction in urban districts mainly consisting of wooden buildings. On the other hand, there is an inconvenience in this regulation because a building that is not used as a residence or business by the owner is not subject to permission even if it is on a small-scale lot of less than 300 m². As a result, this regulation restricts the resumption of business by a person who is engaged in commerce or industry. Apart from this, to introduce a system of permanent land-use restriction in areas that have been used in an urban style, it is also necessary to combine this system with a system of compensation or purchase by the government.

Notes

(1) Values as of June 16, 2011. Material for a press release from the Headquarters for Emergency Disaster Control of the Cabinet Office.

(2) From an April 8, 2011, article in the

Kahoku newspaper. The target is six cities—Kesennuma, Ishinomaki, Higashimatsushima, Tagajo, Natori, and Iwanuma—and five towns—Minamisanriku, Onagawa, Shichigahama, Watari, and Yamamoto.

(3) In response a committee member said, “It is important that the selection is left to local municipalities and that the central and prefectural governments fully respect their intentions as much as possible and provide support in response to their intentions.”

(4) From a hearing of the Iwate Prefectural Government’s City Planning Division, April 28, 2011.

(5) At the time of city and ward amendments in Tokyo, the Deputy Minister of the Interior, Akimasa Yoshikawa, described the procedure of planning by saying, “The design of roads, bridges, and rivers are the roots. When they are determined, the design of waterworks, housing, and sewerage can be determined easily” (Ishida 2004).

(6) Ishinomaki City carried out a basic questionnaire survey of disaster victims concerning urban infrastructure development in the period from May 1 to May 15. The results revealed that individuals’ intention to continue to live in their present places in the community significantly differed depending on the affected area and their age.

(7) Emergency evacuation regulations include regulation of building (up to two months after the occurrence of the disaster) under Article 84 of the Building Standards Act. Regulations on securing a planning period include the “building regulation in the urban disaster recovery promotion areas” under Article 7 of the Act on Special

Measures Concerning Reconstruction of Urban Districts Damaged by Disaster to secure a planning period for urban planning and the execution of land readjustment projects up to two years after the occurrence of a disaster. Business mortgage regulations include the building regulations under Article 53 of the City Planning Act to secure the construction of city planning facilities and the implementation of urban development projects. Land utilization regulations include the building regulations under Article 39 of the Building Standards Act to permanently eliminate building activity in disaster-risk areas. On April 29, 2011, the Act for Special Exceptions to Building Regulation in Urban Areas Severely Damaged by the Great East Japan Earthquake was promulgated, making it possible to impose building restrictions until November 11, 2011, regardless of the provisions of Article 84 of the Building Standards Act.

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PROPOSALS OF THE RECONSTRUCTION DESIGN COUNCIL IN RESPONSE TO THE GREAT EAST JAPAN EARTHQUAKE AND FUTURE DEVELOPMENTS

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The Reconstruction Design Council in Response to the Great East Japan Earthquake and Its Proposals

The Japanese government established the Reconstruction Design Council in Response to the Great East Japan Earthquake (the Council), composed of 16 members including experts in various fields, in order to deliberate on reconstruction policies related to the Great East Japan Earthquake that hit March 11, 2011. The first meeting of the Council was held on April 14. The Council also includes study groups to conduct technical investigations. After the Council met 12 times and study groups 8 times, a report on the Council's proposals titled *Towards Reconstruction "Hope beyond the Disaster"* was submitted to the Prime Minister on June 25. Immediately before that, on June 24, the Basic Act on The Great East Japan Earthquake Reconstruction (the Basic Act) came into effect, which gave the Council legal authority to examine and discuss (1) important reconstruction related issues and (2) how reconstruction related policies are being implemented. Having submitted its proposals on the overall image of reconstruction measures, the

Council will now focus solely on fulfilling its role related to item (2).

The governor of Fukushima Prefecture is a member of the Council, and discussions have covered not only damage from the earthquake and tsunami but also damage from problems at the nuclear power plant. The Basic Act allows the creation of a separate council to deliberate on issues related to the recovery of the area impacted by problems at the nuclear power plant; therefore, if the problems related to the nuclear plant are brought under control a different body than the Council may examine reconstruction policies for that area.

A summary of the minutes of the Council are posted on the website of the Office of the Prime Minister, and the June 25 report on the Council's proposals, along with an English version titled *Towards Reconstruction "Hope beyond the Disaster"*, have been made public. The report consists of the main body with four chapters, an introduction, and a conclusion. Chapter 1 of the report, *A New Concept for Rebuilding the Region*, covers the important issue of reconstructing villages and cities, not at their original location, but at safe locations where they will be protected from tsunamis in the future, a unique issue related to

the tsunami. Chapter 2, *Restore Life and Livelihood*, covers rebuilding important industries and employment and social systems such as those related to welfare, medicine, and education in addition to reconstructing physical facilities. The last section of the chapter discusses financial resources for reconstruction. In Chapter 3, *Work Towards Reconstruction After the Nuclear Accident*, proposals are provided regarding various measures that will be important in the future, such as support for victims, monitoring radioactive material and radiation, measures to deal with soil contamination, and health management, but it is impossible to say that these topics were sufficiently covered in the report since the situation at the nuclear power plants has not been brought under control yet. In chapter 4, *Open Reconstruction*, we discuss how it is important to consider the reconstruction process from a wide range of perspectives including the ideal form of the future Japanese economy and society, connections extending outside Japan, and building a country resilient to disasters.

How to Create Safe and Secure Regions

Creating safe and secure regions, which is discussed in chapter 1, is particularly important for the areas hit by the tsunami. How to ensure safety is a pressing issue since the Sanriku area, which was hit by the tsunami on March 11, and the area that stretches from the Sendai plain to Fukushima Prefecture are areas susceptible to tsunamis as they have frequently been hit by them, and most victims from the area think they will likely be hit by another major tsunami during their lives, or the lives of their children or grandchildren. Records show that numerous earthquakes including the Jogan earthquake (869), Keicho Earthquake (1611), Meiji Sanriku Earthquake (1896), Showa Sanriku Earthquake (1933), and the earthquake that struck off the coast of Chile resulted in large numbers of victims. Of these earthquakes, the one that hit off the coast of Chile, which is on the other side of the Earth, was of course not felt in Japan, and the Meiji Sanriku Earthquake was small but caused a major tsunami. People have learned that one of the scary things about tsunamis is that they can suddenly hit without clear omen.

Based on these experiences, the most effective countermeasure against tsunamis is adhering to the tradition of living on higher ground that tsunamis cannot reach, and some villages traditionally prohibited people from living in low-lying areas. However, many local residents work in the fishing and agricultural industries and there is flat ground near harbors and the ocean, making it impossible to resist the temptation of living on the seashore and flat land that are convenient in terms of both transportation and daily life. Even so, since the Meiji Era, efforts have been made to move people to higher ground each

time a tsunami has hit causing casualties. This tendency was particularly strong after the Showa Sanriku Earthquake when the government pressed people to move to higher ground, which resulted in more than 50 villages being moved. This was when villages were most recently moved to safe higher ground. The results of those efforts, however, were not very good as less than five of these villages can be considered to have been constructed on safe ground. There were only two villages that I visited, Yoshihama and Shirahama (Ofunato-shi, Iwate), that can say they escaped major damage from the tsunami directly because of having been moved to higher ground. Different villages sustained damages for different reasons. Taro (Miyako-shi, Iwate) gave up moving to higher ground since there was no appropriate higher ground close by and built a seawall instead but sustained major damage; Ogatsu (Ishinomaki-shi, Miyagi) and Tanohama (Yamada-cho, Iwate) thought they had moved to higher ground but the location was not high enough and the villages were damaged by the recent tsunami; and Toni (Kamaishi-shi, Iwate) and Oya (Kesenuma-shi, Miyagi) moved to higher ground and while households on higher ground avoided damage, those on low-lying ground were damaged so the overall village was not safe. The list goes on.

The Council, therefore, stressed in its proposals the importance of moving cities and villages to safe locations by expanding the related system and financial resources. At the same time, the Council divided areas damaged by the disaster into several types depending on topological traits and suggested countermeasures for each type such as residential areas the municipality to higher ground, raising the ground or creating artificial ground, or adopting the concept of damage mitigation, using breakwaters and seawalls to protect the

whole town or village from normal events such as typhoons but only residential areas, not other areas, from flooding caused by major tsunamis. Many local residents of areas hit by the tsunami have close ties to the ocean, such as working in the fishing, agricultural, or marine product processing industry, and they would have difficulty in making a living if they lived on higher ground cut off from the ocean. Therefore, homes, facilities for the elderly, medical facilities, education facilities, and similar ones should be constructed on higher ground so that people can properly respond even if a tsunami were to hit with little warning or at night. On the other hand, areas including industrial zones could be located on low-lying land if certain conditions are met such as there being tsunami shelters and a sufficient number of shelters for residents and escape routes being wide enough so that people could flee by car. This would balance daily-life convenience with safety. The critical question is whether it is possible to find higher ground near villages damaged by the tsunami so they can be moved. Several villages have already selected possible land and are rushing to create concrete plans, but it may be difficult to find sufficiently large flat area on higher ground for villages located at the foot of steep hills.

Rebuilding Work and the Future Reconstruction Process

Just as important as ensuring the safety of physical structures of towns and villages is ensuring industry, employment, and various types of social services such as welfare, medical treatment, and education. If services and sources of income necessary for daily life are lost, residents will move away no matter how safely a village

is rebuilt. In terms of industry and employment, it is important to sustain local traditional industries such as fishing, manufacturing including marine product processing, and agriculture. However, even these industries face the danger of dying out for various reasons including owners and workers growing old. Therefore, in addition to preserving these traditional industries, it is important to adopt aggressive measures to develop new industries and expand employment opportunities in order to make the recovery possible in the long term. Possible new industries include local energy industries that supply natural energy to the community; the biotechnology industry that makes use of marine resources; the automobile industry, which has been growing in the area in recent years; and a tourism industry based on the ria coast with picturesque scenery. The key to the reconstruction process is moving from the stage of possibilities to the stage of attracting actual investment. In addition to the residents of areas hit by the disaster, there are many entrepreneurs who would like to contribute to these disaster areas. It is vital, however, to create a process so that investments are made not out of sympathy but because

of actual benefits. Therefore, I propose that "Machidukuri companies", private and public partnership entities, should be established to bring new community businesses and job opportunities.

Finally I would like to discuss the development of reconstruction efforts. Based on the proposals of the Council, the government laid down basic reconstruction guidelines at the end of July. It was particularly important that the government gave a general indication of the cost of reconstruction, which was not clearly stated in the proposal, and the source of funds to cover the cost although the details were not shown clearly. As of the writing of this paper, reconstruction is expected to cost around 23 trillion yen; 19 trillion yen will be used during the first five years, which includes 6 trillion yen in the first and second supplementary budgets that have already been decided upon. Around 13 trillion yen from higher taxes and non-tax revenue will be allocated to reconstruction. The government needs strong coordinating abilities to secure the source of funds. In addition, the Act on Special Measures Concerning Reconstruction must be effective for achieving various objectives through the use of special zones such as comprehensively coordinating the

use of land currently zoned for various purposes such as existing urban land, agricultural land, and mountains and forests, supplying community-based power, allowing the entry of the private sector into industries such as fishing, and promoting public-private collaboration for rebuilding industries.

On the other hand, the process of creating reconstruction plans for cities damaged by the disaster is entering its final stage. The most important issue is achieving agreement among residents to move to safe higher ground. At the same time, it is necessary to recruit participants in and supporters of reconstruction from the private and public sectors in areas that were not damaged by the disaster and to strengthen the system for reconstruction so that victims of the disaster can lead future reconstruction efforts through public-private sector cooperation. Horizontal partnerships between the private and public sectors in areas hit by the disaster, vertical partnerships among the central government, prefectures, and municipalities, and various forms of support provided from throughout Japan must be harnessed to make it through the coming period of intensive reconstruction effort, which will last at least 5 years.