
2-2 Report on the Great East Japan Earthquake

It has been one month since the Great East Japan Earthquake and subsequent tsunami devastated the Pacific coast of northeastern Japan. As of April 11, records indicate that the disaster has left 13,116 people dead, 14,377 people missing, and 147,536 people displaced and still living under difficult conditions in evacuation centers. On April 9, the first evacuees began moving into temporary housing units, and recovery and rebuilding in the disaster-affected areas is gradually progressing. The following provides a profile of the earthquake and describes the current state of recovery based on a field survey conducted from 21-24 March, and on documents published by various government agencies and the mass media.

(1) Profile of the Earthquake

- Date and Time: 11 March 2011 at 14:46 JST (5:46 GMT)
- Type of earthquake: Plate-boundary thrust-faulting earthquake on or near the Japan Trench subduction zone
- Hypocenter: 130km off the Pacific coast of the Tohoku region (38°N, 142°E), 24km depth
- Magnitude: 9.0 (interim value, the largest in Japan)

The areas hit by the Great East Japan Earthquake are known to be vulnerable to tsunamis, as they have experienced tsunamis in the past. A large inter-plate earthquake had been predicted for this region, with a 99% probability within 30 years, at magnitudes ranging from M7.5 to M8.0. However the March 11 earthquake was much larger than predicted, at a magnitude of M9.0 and a rupture zone measuring 500 km long and 200 km wide. This was the fourth-strongest earthquake ever recorded in the history of the world. Some experts say that this kind of earthquake and tsunami occurs only once every thousand years.

c.f. 1960 Chile Earthquake M9.5, 1964 Alaska Earthquake M9.2, 2004 Sumatra Earthquake M9.2

(2) Damage

The number of casualties continues to rise. The government has confirmed 13,116 fatalities as a result of this disaster. It has already exceeded that of the 1995 Great Hanshin-Awaji (Kobe) Earthquake, making it the worst earthquake since World War II. There are 8,017 dead in Miyagi prefecture alone, accounting for more than half of the death toll. The number of people who are missing covers only those who have been reported to the police by their families or acquaintances.

The number of evacuees once topped 300,000, but it has been falling as the situation has stabilized and services and utilities have gradually been restored. The number of casualties in major cities and towns is indicated in the table below. There have been more than 1,000 confirmed fatalities in the cities of Rikuzen-Takata and Ishinomaki. There are more than 10,000

evacuees in the cities of Rikuzen-Takata, Kesenuma, and Ishinomaki. The ratio of evacuees is about 50% in Rikuzen-Takata city and Minami-Sanriku town, indicative of the complete devastation experienced in these municipalities. The ratio of evacuees is more than 20% in the towns of Yamada, Otsuchi, and town.

Prefecture	Dead	Missing	Evacuees
Iwate	3,811	4,721	45,319
Miyagi	8,017	6,416	53,468
Fukushima	1,226	3,236	25,663
Others	62	4	23,086
Total	13,116	14,377	147,536

Casualties by Prefecture (as of April 11)

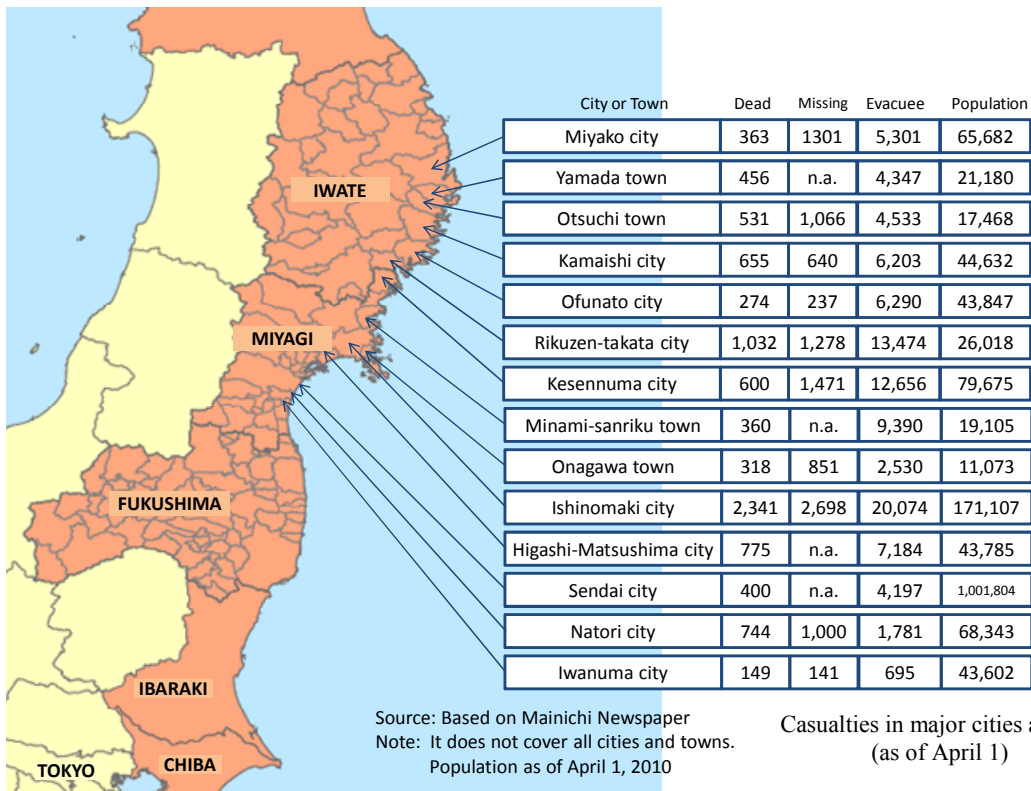
On the other hand, the value of the destruction of the social infrastructure, housing, and corporate facilities is estimated at between 16 and 25 trillion yen (Cabinet Office). Most of the prefectures that were most severely affected depend largely on the agricultural and marine product industries. These key industries were badly damaged. The total damage to farmlands, agricultural facilities, and agricultural produce is estimated at 520 billion yen. The rebuilding of farmlands is likely to be particularly problematic, since those lands will have suffered salt damage. As for the fishing industry, 19,000 fishing boats were damaged, and the total damage to the industry, including boats and facilities, is valued at 350 billion yen. Rebuilding these industrial bases is of supreme importance for the local economy and job security.

(3) Disaster-Affected Areas

Several disaster-affected areas in Miyagi prefecture were surveyed in March; their situations are outlined below.

1) Wakabayashi Ward, Sendai City

Wakabayashi ward is located in the coastal area of Sendai city, and was one of the areas more severely hit by this earthquake. This area has no historical record of any large tsunamis, and local hazard maps were designed around a maximum tsunami wave height of 3m. In reality, however, a much larger tsunami hit the area. A belt of windbreak forests had been built along the seacoast as a preparedness measure, and the elementary schools had been designated as evacuation sites since there are no hills in the area.



2)Ishinomaki City & Higashi-Matsushima City

Ishinomaki city, the second largest city in Miyagi prefecture (population: 170,000), has a port, a fishing port, and factories owned by such companies as Nippon Paper Industries Co., Ltd. The city's downtown area sustained massive damage as a result of the tsunami and resulting fires, which caused many casualties. The coastal residential areas of Higashi-Matsushima city, which is located next to Ishinomaki, also sustained massive damage.



Search activities in Arahama district, Wakabayashi ward (22 March 2011)



The downtown area of Ishinomaki city (22 March 2011)



The coastal residential area of HigashiMatsushima city (22 March 2011)

3)Onagawa Town

Onagawa town, which is known as Onagawa fishing port, is located in eastern Miyagi

prefecture. Onagawa's downtown area was totally destroyed by the tsunami. Along the coast, wooden houses were carried away, leaving only their foundations, and even reinforced concrete buildings collapsed. The Onagawa town office is reported to have been inundated to the roof. A hill just behind the fishing port was designated as an evacuation area. Traces of water were found inside a hospital located on top of this hill,

indicating that even that area, which is nearly 16 meters high, was not out of reach of this tsunami.

4) Minami-Sanriku Town

Minami-Sanriku town is located in northeastern Miyagi prefecture facing the Pacific Ocean. The tsunami washed away most of the buildings in the downtown area, completely devastating the town. At Shizugawa Hospital located near the coast (some 200 meters inland), there were indications that the tsunami had reached the 5th floor. In an apartment building near the seashore, which had been designated as a tsunami evacuation building, there were traces of water indicating that the tsunami had reached the 4th floor.

The disaster management center of Minami-Sanriku, a threestory building, was designed to function as a tsunami evacuation building. When the tsunami struck, about 30 municipal officials evacuated to the rooftop, but only 10 survived. A young official who kept delivering evacuation notices to the villagers until the very last moment has yet to be found. It was generally believed that three-story reinforced concrete buildings could be designated as evacuation buildings, but such structures provided insufficient protection during this disaster.



The coastal area of downtown Onagawa (2011.3.22)



The evacuation route to Onagawa Municipal Hospital (2011.3.22)



Panoramic view of Minami-Sanriku (2011.3.23)



Disaster management center of Minami-Sanriku (2011.3.23)

(4) Effectiveness of Pre-Tsunami Disaster Preparedness Measures

The Pacific coastal areas of Iwate prefecture and the northern part of Miyagi prefecture (Sanriku Coast) are known to be vulnerable to tsunamis, as they had been devastated by the tsunamis that occurred following the 1896 Meiji-Sanriku earthquake, the 1933 Showa-Sanriku earthquake, and the 1960 Chile earthquake. Various measures, both structural and non-structural, had been taken in those areas to protect

people and communities from tsunamis. The most notable were the construction of a 10 m high and 2.5 km long dyke in the Taro area of Miyako city, often called “the Great Wall,” and the construction of the world’s largest breakwater (8 m above sea level, and 63 m deep) in Kamaishi city. The structural measures must have reduced the impact of the tsunami, but were found to be insufficient to protect people’s lives in this case.

Non-structural measures complement structural measures. The media has reported that measures such as preparedness education and lessons learned from past disasters helped people escape from the tsunami, as indicated in the following cases. The preparedness education conducted before the tsunami enabled the pupils at primary and junior high schools in Ishinomaki city (one of the most severely damaged cities) to successfully escape the tsunami. The Mizuhama area of Ishinomaki city, which is comprised of 130 households, was completely destroyed by the tsunami.

Earthquake	Date	Magnitude	Epicenter	Killed / Missing	Height of Tsunami (Max)
Meiji-Sanriku	June 15 1896	8.2	Off Iwate	21,959	38.2 m
Showa-Sanriku	March 3 1933	8.1	Off Iwate	3,064	29.3 m
Chile	May 22 1960	9.5	Off Chile in South America	142	5.6 m

Major Earthquakes Affecting the Tohoku Region

However, only one person died and eight people were reported missing out of the total population of 380 residents. This shows that the residents' knowledge of what to do in an earthquake and their performance of regular exercises and drills helped them survive.

Nearly 150,000 displaced people are staying at evacuation centers, such as community centers, schools, and sports stadiums. This figure does not cover those who are staying in their homes, cars, or other locations under harsh living conditions. Since the provision of temporary shelters will take many months and the sanitation conditions at the evacuation centers continue to deteriorate, some local authorities, such as Minami-Sanriku town, have started to temporarily relocate some evacuees to other places with better living conditions, such as hotels and public apartments in less affected areas.

1) Temporary Housing

On March 14, MLIT asked the Japan Federation of Housing Organizations to construct 30,000 temporary housing units in two months. The construction started in Rikuzen-Takata, Iwate prefecture on March 19, and the transition of residents into those homes started on April 9. Similar construction efforts have also been launched in other cities and towns, and as of April 11, 7,454 temporary housing units were being constructed at 78 sites. Considering the high demand, the prefectures have increased the number of required temporary housing units. MLIT has therefore asked the housing companies to construct another 30,000 units, in addition to the 30,000 units requested in March.

2) Removal of Debris

The tsunami created a huge amount of debris from collapsed structures, washed away cars, boats, and other materials, and these have been scattered throughout the tsunami-hit areas. Debris is still blocking roads and streets. The estimated amount of debris in Miyagi prefecture alone is between 15 and 18 million tons -equivalent to 23 years of waste generated under ordinary circumstances. Moreover, there is a growing

concern that the debris could be harmful to human health and the environment as temperatures start to rise and the rainy season begins in June. The cleanup and disposal of debris is complicated by the need to consider many different elements, including cars, boats, toxic waste, and items of personal value.

3) Bills, Supplementary Budget, and Other Efforts

A Reconstruction Plan Committee was established on April 11 to serve as an advisory body to the national government. The government is now preparing some other bills, which propose various policy measures and necessary mechanisms for full-fledged recovery and reconstruction, which are to be submitted to the Diet (Japanese parliament). The proposals include the establishment of new institutions to be responsible for the implementation of recovery and reconstruction.

The government is also preparing supplementary budget proposals for deliberation in the Diet, which are reported to propose the allocation of more than 10 trillion yen to disaster-related efforts. It is also reported that the government is examining a plan to relocate residents of tsunami-hit areas to higher ground, where new communities can be built, and to purchase the areas totally devastated by the tsunami, since these will not be suitable for the rebuilding of communities.



Evacuation center in Minami-Sanriku (2011.3.23)