WHITE PAPER ON LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM IN JAPAN, 2010

Part1

Ministry of Land, Infrastructure, Transport and Tourism

WHITE PAPER ON LAND, INFRASTRUCTURE, TRANSPORT, AND TOURISM IN JAPAN, 2010
Ministry of Land, Infrastructure, Transport, and Tourism (MLIT)

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White Paper on Land, Infrastructure, Transport and Tourism
Part I
National Spatial Development to Protect People's Lives and Livelihood
- Overcoming the Great East Japan Earthquake Unparalleled in History-

Preface

The Great East Japan Earthquake of March 11, 2011 and the tsunami caused thereby, resulted in the worst disaster since the end of the Second World War. In a country surrounded by ocean, fertile seaside regions nurtured by rich cultures and traditions, were devastated with the loss of numerous precious lives and livelihoods in mere moments.

Natural disasters repeatedly have hit Japan throughout history and we have accumulated knowledge from those past experiences to prepare for future disasters. However, many lives have been lost in natural disasters every year. Each life lost and each livelihood damaged in past disasters has immeasurable value. Among disasters in Japan's history, the Great East Japan Earthquake – combimed with the first nuclear emergency the country has ever faced -- turned out to be unparalleled in its scale and in the level of widespread damage.

Japan experienced Hanshin-Awaji Earthquake in 1995, in which more than 6,000 people were killed or went missing. Then it witnessed the 2004 Sumatra Earthquake and tsunami of the Indian Ocean, during which more than 200,000 people were killed or went missing.

In Japan, huge disasters have repeatedly hit area around the Sanriku coast: the Meiji-Sanriku Earthquake and Tsunami of 1896; the Showa-Sanriku Earthquake and Tsunami of 1933; and the 1960 tsunami caused by earthquake in Chile. After each disaster, we strengthened our efforts to prepare for future disasters, repeatedly practicing disaster prevention drills and passing along our experiences to future generations.

Although such measures were effective and saved many lives in the Great East Japan Earthquake, the preparation was not enough.

It is impossible to fully imagine the sadness of the people who lost beloved ones. The disaster still continues for everyone, from infants to the elderly, especially for those whose houses were flooded by the tsunami and for those who were forced to evacuate from their hometowns due to the accidents at the nuclear power stations. There are nationwide and regional cooperative efforts to assist the victims.

The government of Japan and the Ministry of Land, Infrastructure, Transport and Tourism (hereinafter called MLIT) have been making a concerted effort to support afflicted people with the primary objective being to save lives. We have also accelerated efforts to rebuild the livelihood of the afflicted regions and their people, through flexible and unprecedented approaches.

Even before the Great East Japan Earthquake, Japan had already come to a significant crossroad, searching for the ways to realize sustainable growth and overcome deepening regional distress under the structural changes of the Japanese economy and society, including an aging population, an enormous fiscal deficit, and heated global competition. After this disaster, while taking those issues into consideration, we are expected to rebuild regions by bringing new vitality, instead of bringing them back to their previous status.

MLIT will step forward with such measures in cooperation with those afflicted people and regions.

There will always be earthquakes and tsunamis in Japan. Our country is located above the boundary of four plates, where a possibility of a massive earthquake and tsunami will always exist. Scientists have sounded an urgent alarm for the possibility of massive earthquakes caused by crustal deformation (like the Tokai, Tonankai, and Nankai earthquakes) as well as an earthquake in the Tokyo metropolitan area.

In the words of Torahiko Terada, "A disaster happens when people least expect it." This admonishes our false sense of confidence in our preparations and our belief that mishaps will never happen. It is the essential foundation for disaster management. Building disaster-resistant regions is the primary mission of MLIT. It will never take for granted the lost and suffered lives, and will, as much as possible, take collective efforts to mitigate damages caused by natural disasters.

Japan had developed so rapidly after the Second World War that it became one of the world's prominent economic powers. In the process, we have overcome a lot of trials and tribulations, including the oil energy crisis and the Great Hanshin-Awaji Earthquake. We must pull together all our people's efforts to overcome this unparalleled national crisis and accomplish restoration to ensure the country’s future. We must also pass our beautiful landscape from our ancestors to future generation.

We have received a great deal of help and acclaims from all over the world for our sense of composure and our unyieldingness in this great disaster. While appreciating such warm support, we must rebuild the livelihoods of the afflicted people, revive affected regions, and make our country safe and comfortable, bringing hope for the future. Sunrise comes after night without fail.

Chapter 1: A Disaster Unparalleled in History and the Unified All-Out Operations of MLIT.

Section 1: Breakout of the Great East Japan Earthquake

1. Complex Disaster of Massive Earthquake, Huge Tsunami, and Nuclear Emergency.

The Biggest Earthquake in Japan's Recorded History

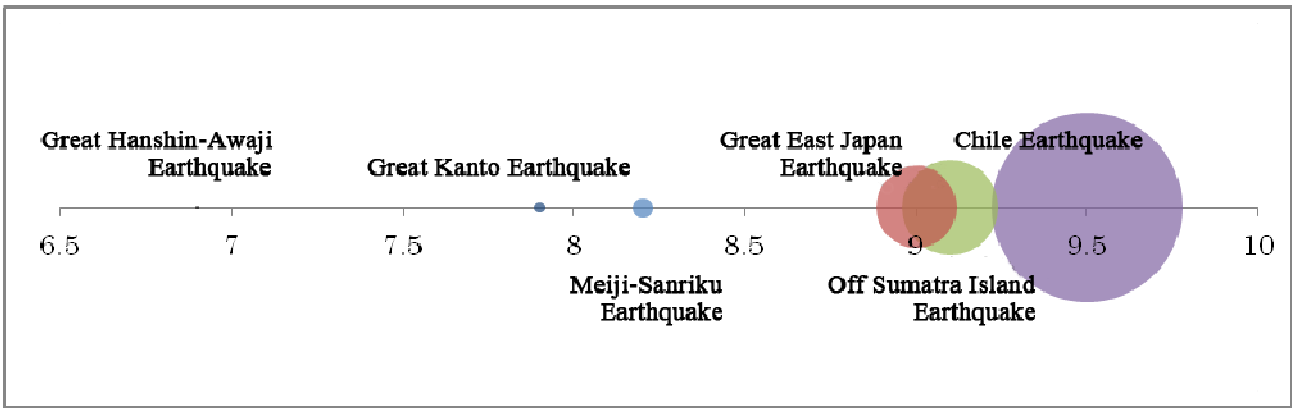
At 2:46 pm on March 11, 2011, Japan was hit with the largest natural disaster since the end of the Second World War. It is now referred to as the Great East Japan Earthquake[1]. Its epicenter was 24km deep off the Sanriku coast (about 130km east-southeast off the Ojika peninsula), and its power was magnitude 9.0, the worst and the largest in Japan's meteorological records. In the world's records since 1900, it falls into 4th place, after significant earthquakes like the Chile Earthquake of 1960 and the Sumatra-Andaman Earthquake of 2004.

1: Massive Earthquakes Worldwide since 1900

Year	Place	Moment Magnitude
1960	Chile	9.5
1964	Alaska	9.2
2004	West Coast of Sumatra, Indonesia	9.1
2011	Near the East Coast of Honshu, Japan (Great East Japan Earthquake)	9.0
1952	Kamchatka peninsula	9.0
2010	Offshore Bio-Bio, Chile	8.8
1906	Off the Coast of Ecuador	8.8
1965	Rat Islands, Alaska	8.7
2005	Northern Sumatra, Indonesia	8.6
1950	Assam – Tibet	8.6
1957	Andreanof Islands, Alaska	8.6

Note: The moment magnitude (Mw) is calculated based on gaps between the faults, the cause of earthquakes.
Source: MLIT, based on the source of the United States Geological Survey.

2: Comparison of Seismic Energy



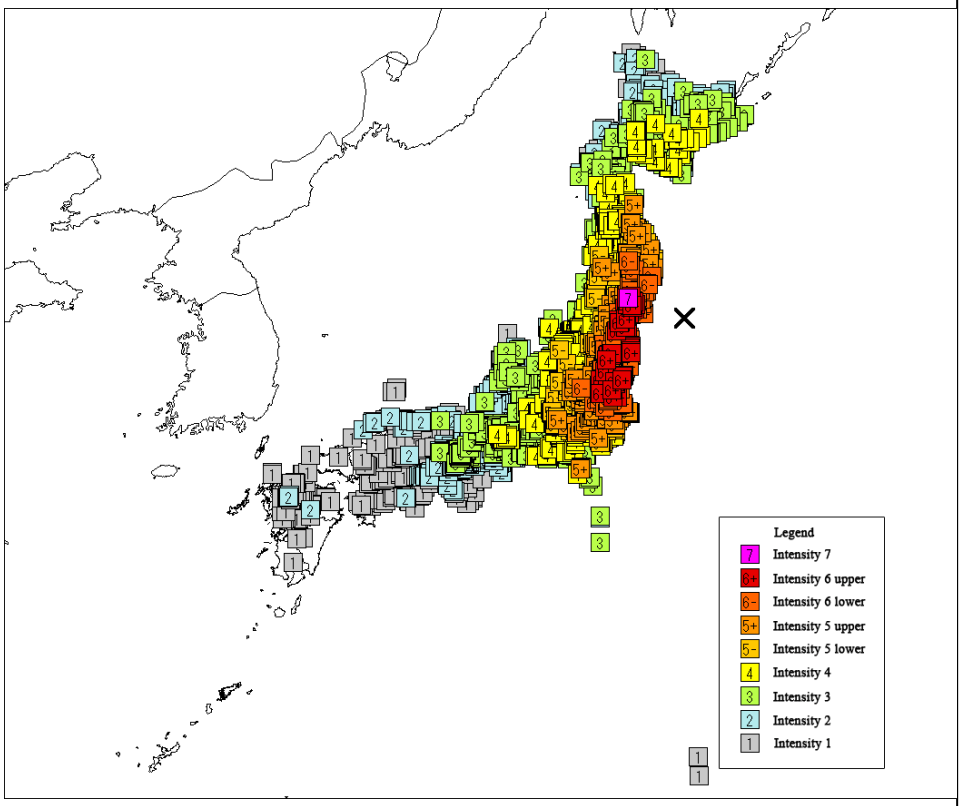
Note: The horizontal axis shows moment magnitude (Mw); the size of the circles shows seismic energy (one greater magnitude means 32 times more energy). The Mw of the Great Hanshin-Awaji Earthquake was 6.9.
Source: MLIT

[1] Japan Meteorological Agency named this earthquake "The 2011 off the Pacific coast of Tohoku Earthquake". After that, the round-robin cabinet meeting of April 1st decided its name as "the Great East Japan Earthquake".

In this earthquake, intensity 7 was observed in Kurihara City in Miyagi after 6 and half years since the Mid-Niigata Earthquake. A widespread area experienced destructive shakings, including the prefectures of Miyagi, Fukushima, Ibaraki, and Tochigi.

This massive earthquake was caused by plate deformation on the boundary between the Pacific plate and the overriding plates. The source area extended from off the coast of Iwate to off the coast of Ibaraki. It is estimated that the earthquake occurred because more than 450km long and 200km wide of the fault was destroyed with the slip of 20-30 meters. It is also considered that the destruction of the fault started off the coast of Miyagi and took around three minutes to run off the coast of Iwate and then to off the coast of Fukushima and Ibaraki. Due to the plate destruction, sea bed right above the epicenter moved east-southeast by 24km and was heaved by 3 km.

3: Seismic Intensity Map of the Great East Japan Earthquake



Source: Japan Meteorological Agency.

Massive Tsunami Hits a Wide Area

Three minutes after the outbreak of the massive earthquake, Japan Meteorological Agency (hereinafter called JMA) announced the warning of a huge tsunami on the Pacific coast in Iwate, Miyagi, and Fukushima. Until the evening of March 13, the JMA continued to announce warnings in coastal areas of the country. The tsunami caused by the massive earthquake surged onto coasts in wide areas, from Hokkaido to Okinawa, centering along the Pacific coast along regions of Hokkaido, Tohoku and Kanto.

More than 9.3 meters, the maximum height recorded in domestic tsunami observatory points of JMA, was recorded at Soma in Fukushima (65 minutes after the earthquake).In Ayukawa, Ishinomaki City in Miyagi, more than 8.6 meters of tsunami was also recorded (40 minutes after the earthquake). In the places where the tsunami destroyed observatories, its height may have been higher than what was

4: Massive Tsunami resulting from the Great East Japan Earthquake

Near Miyako-Ohashi, Iwate

Ofunato Area, Iwate

Sources: Miyako City, Iwate (left); Ofunato City, Iwate (right).

recorded. JMA estimates that a tsunami of 16.7m might have hit Ofunato City in Iwate, based on its research using records such as tsunami traces.

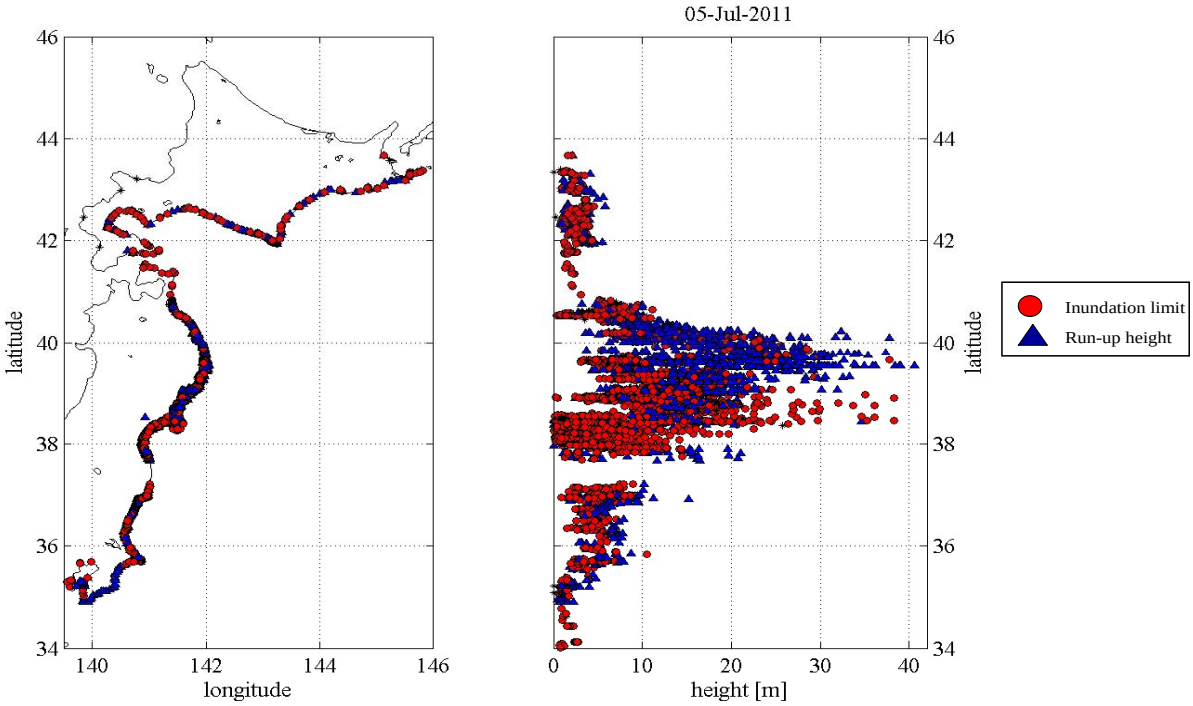
In the Taro district in Miyako City in Iwate, the tsunami overrode 10m of coastal levees and damaged a large area. Various academics and research institutions have looked into tsunami damages, one of which affirmed that the tsunami inundated the point of a 30m altitude[1]. Judging from that research, it is considered that the tsunami was higher than recorded at some areas, resulting in extraordinary damages.

5: Heights of Tsunami in the Great East Japan Earthquake

	Maximum height recorded	Estimated height from traces etc.	Run-up height observed in vicinity
Hachinohe	4.2 metres or above	6.2 metres	-
Kuji Port	-	8.6 metres	13.4 metres
Miyako	8.5 metres or above	9.3 metres	7.8 - 28.8 (Taro)
Kamaishi	4.2 metres or above	9.3 metres	16.9 – 17.1 metres (Ryoishi)
Ofunato	8.0 metres or above	16.7 metres	11.0 – 23.6 metres (Ayasato-Shirahama/Nagasaki)
Ayukawa, Ishinomaki City	8.6 metres or above	7.7 metres	16.7 metres (Ogatsu)
Sendai Port	-	7.2 metres	9.9 metres (Sendai Minato Ward)
Soma	9.3 metres or above	8.9 metres	11.8 metres (Soma Port)

Source: MLIT based on materials of the Japan Meteorological Agency on heights of tsunami and of the Port and Airport Research Institute on run-up heights

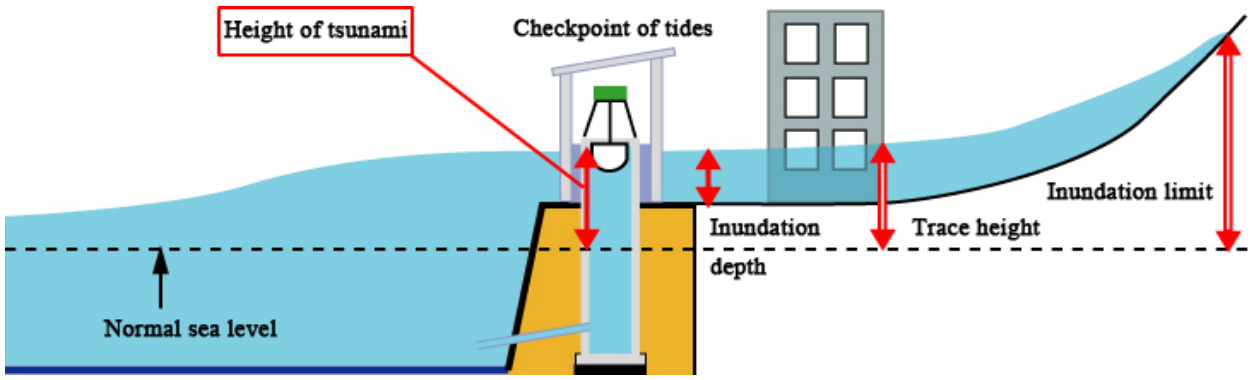
6: Trace Height of Tsunami in the Great East Japan Earthquake



Source: Preliminary reports by the joint survey group for Great East Japan Earthquake (http://www.coastal.jp/ttjt/) as of July 5th, 2011.

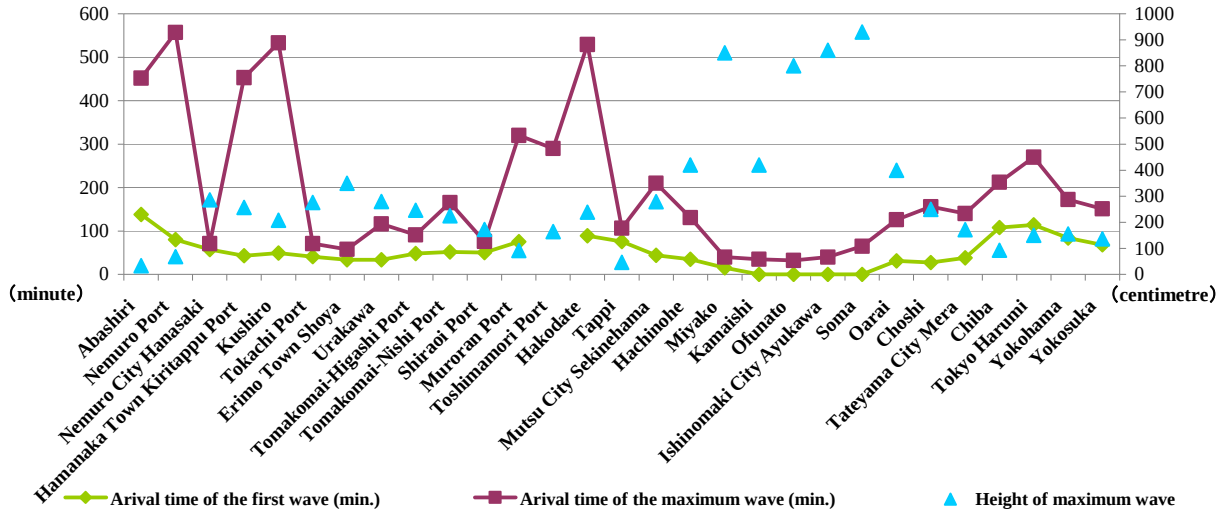
[1] Preliminary results by joint research group for 2011 Great East Japan Earthquake（http://www.coastal.jp/ttjt/). Refer to data as of July 5th, 2011.

7: Height of Tsunami



Source: Japan Meteorological Agency.

8: Time of 1st and Maximum Wave Hitting, and Maximum Height of Tsunami During the Great East Japan Earthquake



Note 1: While it was not possible to track the arrival time of the first wave in Toshimamori Port, Kamaishi, Ofunato, Ishinomaki City Ayukawa, and Soma, it is assumed that the first wave arrived instantly after the earthquake because the vicinity of the coast there is considered to be included in the wave source area.

2: Maximum heights of the tsunami in Tokachi Port, Tomakomai-higashi Port, Shiraoi Port, Tappi, Hachinohe, Miyako, Kamaishi, Ofunato, Ishinomaki City Ayukawa, and Soma are the highest values recorded at tsunami observatory points, which might be lower than actual wave heights.

Source: MLIT, based on materials of the Japan Meteorological Agency

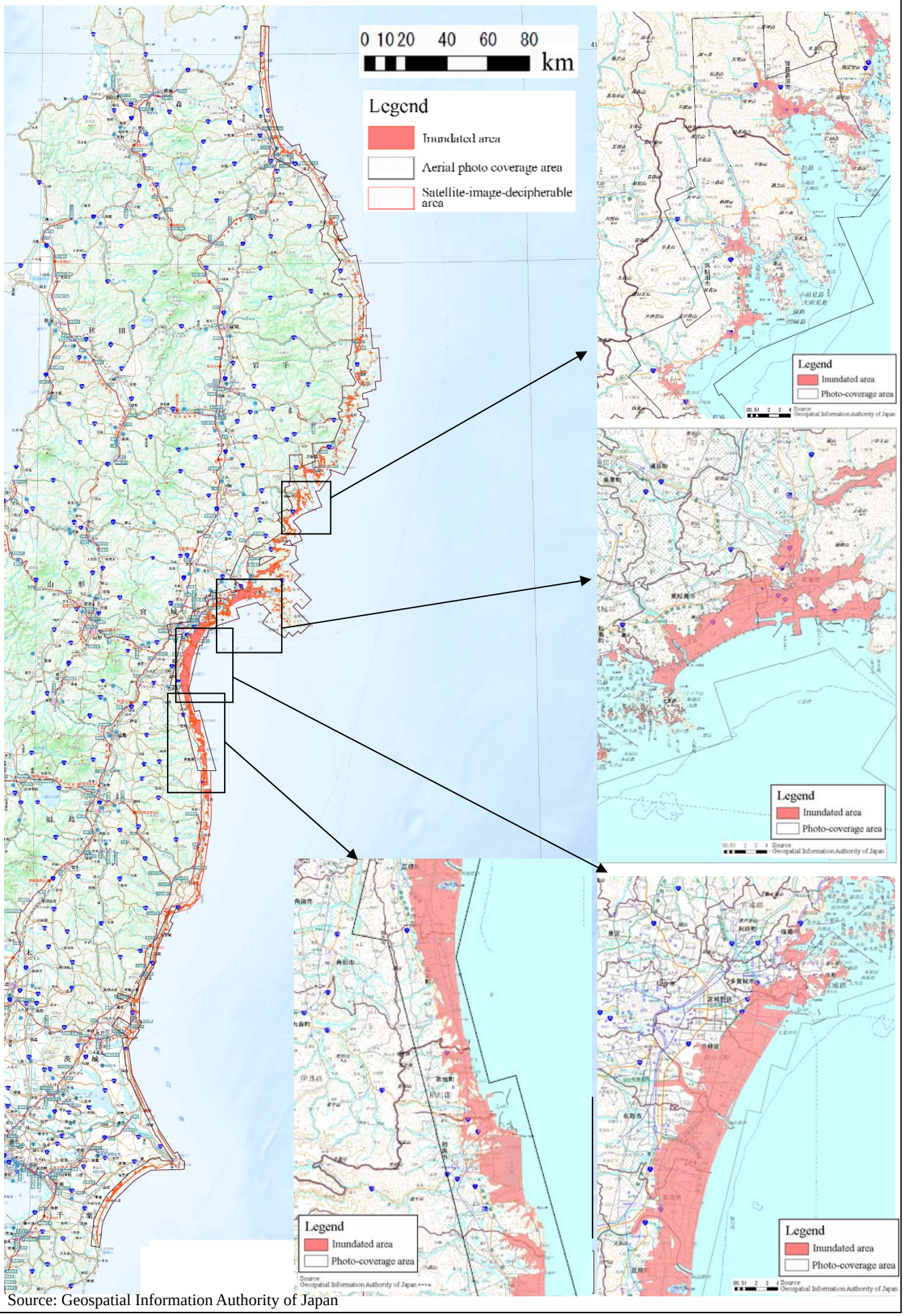
The great tsunami literally swallowed whole towns and fishery settlements dotted across coves along the Sanriku coast. It also inundated a wide area of one of the biggest and best agricultural regions in Japan, extending about 5km from the coastline in Sendai Plain. Tidal waves ran up along rivers such as the Natori River and the Abukuma River, and changed the water level of Kitakami River at the point of 49 kilometers away from its estuary.

Our analysis of the Geographical Survey Institute's aerial photos [1] and our field research [2] affirmed that the total inundated area in 62 municipalities of 6 prefectures (Aomori, Iwate, Miyagi, Fukushima, Ibaraki, and Chiba) was about 535km2, which is 8.5 times as large as the area inside Tokyo's Yamanote Line. Furthermore, more than 40% of the inundated areas were submerged in water over two meters high.

[1] Geospatial Information Authority of Japan (GSI) made maximum efforts to provide geographic information of the affected areas as soon as possible and monitored crustal movements. For example, it started to take aerial photos of the affected areas the day after the earthquake and disclosed to the public on its website such photos and a map of the inundated area.

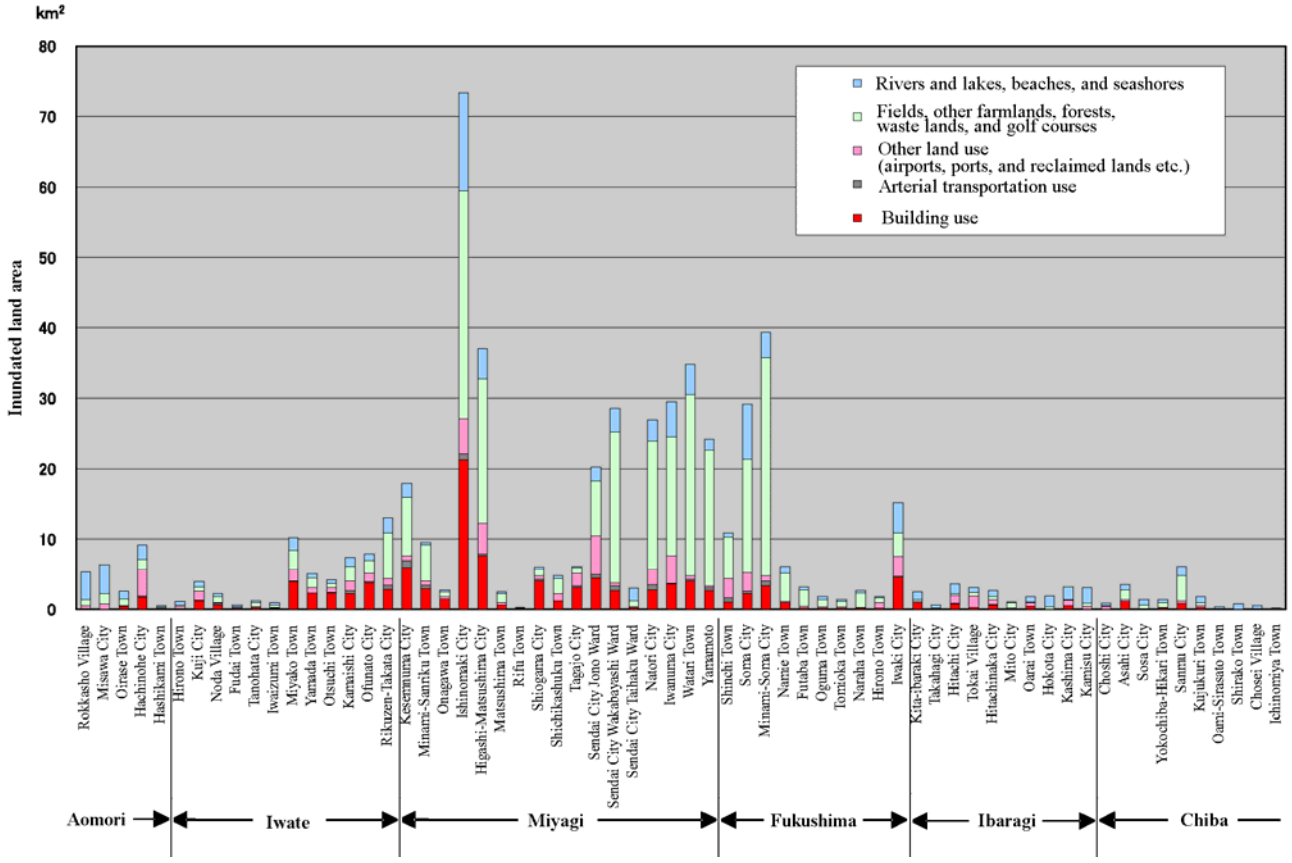
[2] The field research only covers areas reachable until the point of drafting this report and excludes areas we could not reach because of the afflicted conditions (for example areas too close to where the nuclear power station accident occurred). For those un-surveyed areas, inundated-area coverage was estimated from materials including those from local governments and aerial photos. The inundated-area coverage might change due to our continuing research on its details.

9: Area Inundated due to the Great East Japan Earthquake



Source: Geospatial Information Authority of Japan

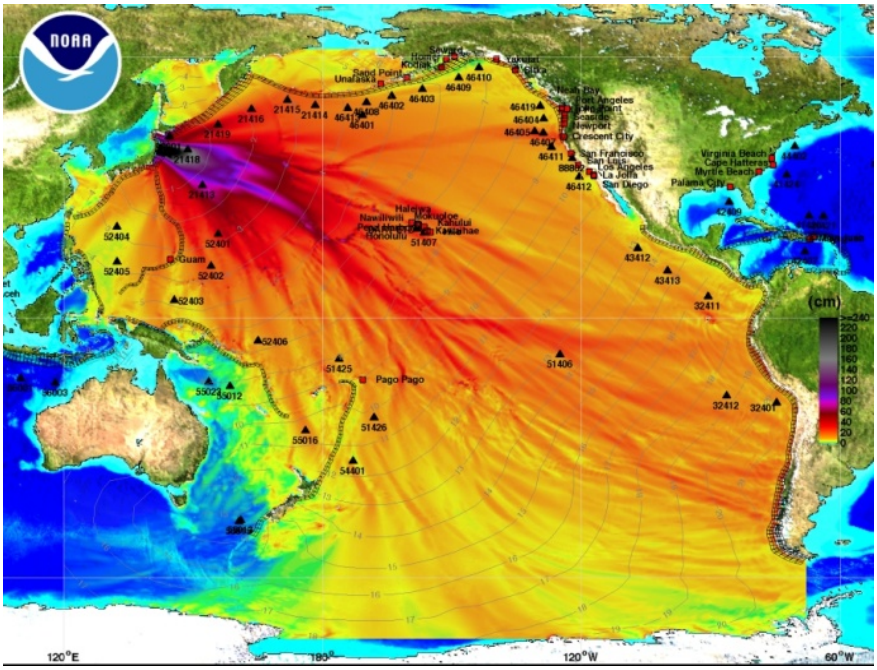
10: Land Use of Tsunami-Inundated Area by Municipalities



Source: Geospatial Information Authority of Japan

The tsunami took about a day to travel across the Pacific Ocean to the United States of America (*e.g.* Hawaii and the Pacific coast of the continent) and South American countries, causing damages there. [1]

11: Diffusion of Tsunami Over the Pacific Ocean in the Great East Japan Earthquake



Note: Calculated results of an analysis model using ocean-floor seismic gauge data in the Pacific Ocean, etc.
Source: National Oceanic and Atmospheric Administration (NOAA) of the United States

[1] Tsunami higher than two meters at maximum was observed in the United States (State of California and Hawaii), Chile, and Ecuador, respectively. Such damages as turnover of anchored yachts and a death in the State of California, US, were reported.

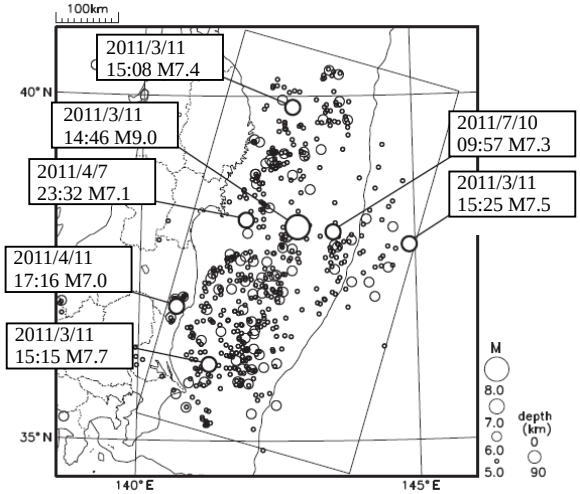
Frequent Occurrence of Aftershocks and Other Earthquakes

On March 9, two days before the Great East Japan Earthquake, an earthquake of magnitude 7.3 and a maximum intensity of 5 lower, with an epicenter was also off Sanriku, occurred in the northern area in Miyagi. Some other earthquakes that were considered to be the aftershocks intermittently followed.

After the Great East Japan Earthquake, aftershocks have been frequently observed, not only in the epicenter belt of 500km long and 200km wide extending from off the coast of Miyagi to off the coast of Ibaraki, but also along the east side of the trench near the epicenter. Until August 11, the following aftershocks occurred: 2 of 6 upper intensity, 2 of 6 lower intensity, 8 of 5 upper intensity, 27 of 5 lower intensity, and 153 of 4 intensity. On April 7 an earthquake of magnitude 7.1 occurred. Its epicenter was off the coast of Miyagi and its maximum intensity of 6 upper was monitored in the northern and middle parts of Miyagi. On April 11 and 12 earthquakes of magnitudes 7.0 and 6.4 occurred. Their epicenter was in Hamadori in Fukushima and a maximum intensity of 6 lower was observed in Hamadori,Fukushima and places nearby. These massive aftershocks caused some deaths and casualties.

Japan Meteorological Agency has been calling for caution as there continues to be a high possibility of large aftershocks with strong intensities and tsunamis in the epicenter region of the Great East Japan Earthquake. [1]

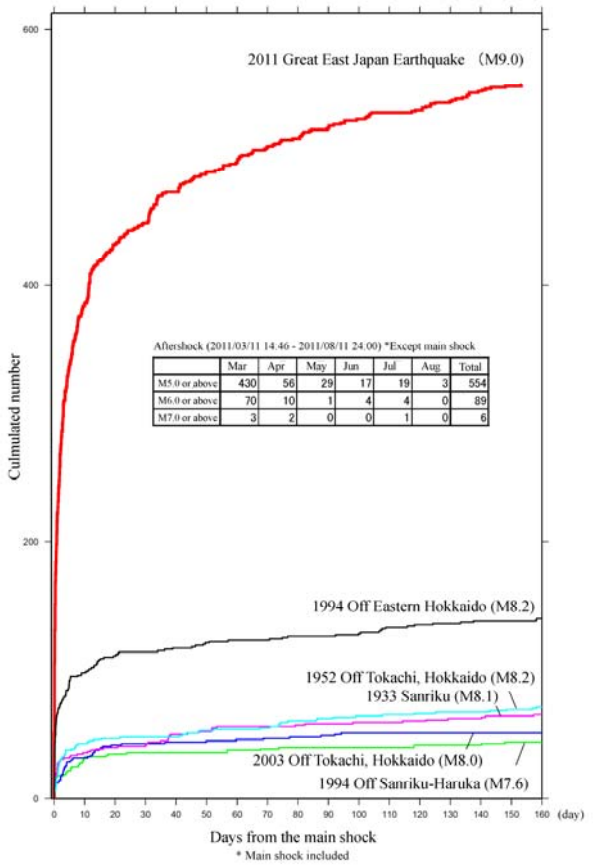
12: Aftershocks of the Great East Japan Earthquake



Note: 1. Until Aug. 11th, 24:00. Depth less than 90km; M≧5.0.
2. The size of the circles shows the level of magunitude.
3. Balloons are applied for earthquakes greater than M7.0.

Source: Japan Meteorological Agency

13: The Number of Aftershocks of Significant Earthquakes Originated in Oceanic Areas



Note: Earthquakes greater than Magnitude 5.0 (main shock included); as of Aug. 11th 24:00.

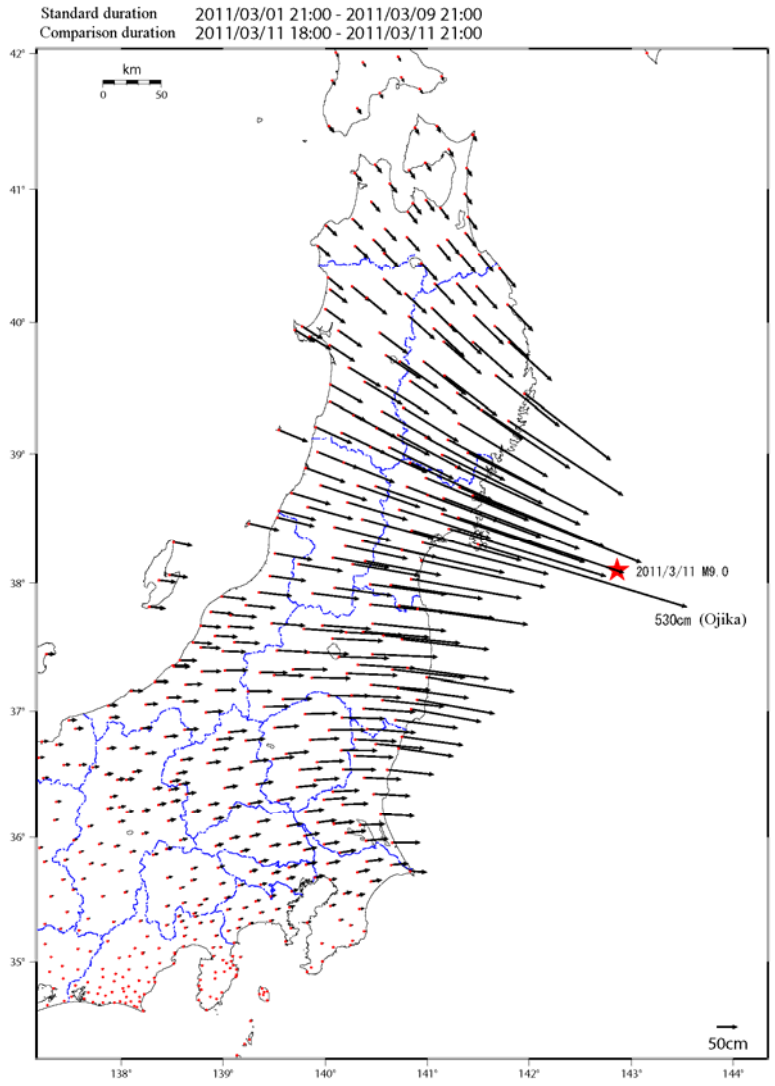
Source: Japan Meteorological Agency

[1] In the case of the Indonesia-Sumatra Earthquake (M9.1), which occurred on December 26, 2004, six earthquakes of M7 or more occurred in the area nearby during the following 5 and half years. (M7.2 on the same day as the main shock of M9.1; M7.2 in July 2005; M7.4 in Feb 2008; M7.5 in Aug 2009; M7.2 and M7.5 in May and June 2010, respectively)

The Great East Japan Earthquake accompanied crustal changes over wide areas across Tohoku, Kanto, and Koshinetsu regions. For example, more than five metres of horizontal crustal movement was observed in Oshika peninsula, Miyagi[1]. Furthermore, in spite of being located outside of aftershock areas, there are areas where seismic activities have become stronger in the Tohoku, Kanto and Chub regions. They are thought to be related to the Great East Japan Earthquake.

On March 12, there was an earthquake with a maximum intensity of six upper and with an epicenter in the northern part of Nagano. On March 15, an earthquake of maximum intensity of 6 upper occurred. Its epicenter was in the eastern part of Shizuoka. Each quake caused injuries and damages to buildings and transportation infrastructures.

14: Crustal Movements in the Great East Japan Earthquake



Source: Geospatial Information Authority of Japan

The Worst Nuclear Emergency in the History of Japan

The Great East Japan Earthquake resulted in the emergency cessation of eleven working nuclear reactors in the five premises along the Pacific coast in the Tohoku Region. The Fukushima Daiichi Nuclear Power Station of Tokyo Electric Power Company (hereinafter called TEPCO) lost all power sources, including back-ups, due to the huge tsunami. As a result, the cooling systems of its nuclear reactors were shut down. This accident is the worst nuclear emergency in Japanese history[2].

This accident diffused radioactive substances across the vicinity, and the radiation level was determined to be at Level 7 of the International Nuclear Event Scale[3],the most dangerous level and as much as that of the Chernobyl catastrophe.

Following the accident at the TEPCO Fukushima Daiichi Nuclear Power Station was another nuclear emergency at the TEPCO

[1] Geospatial Information Authority of Japan analyzed crustal changes using a series of GPS monitoring and concluded Ojika peninsula moved about 5.3kilometres east-southeast and sunk about 1.2 meters downward due to the earthquake.

[2] Act on Special Measures Concerning Nuclear Emergency Management, which was enacted based on the lessons from the JCO critical accident in Tokai Village of Ibaragi Prefecture in 1999, prescribes that if emergencies such as function loss of nuclear reactors or observation of extraordinary amount of radiation happened, the Prime Minister should be immediately reported to issue the Declaration on Nuclear Emergency and create the nuclear disaster management headquarters whose chief is to be the Prime Minister.

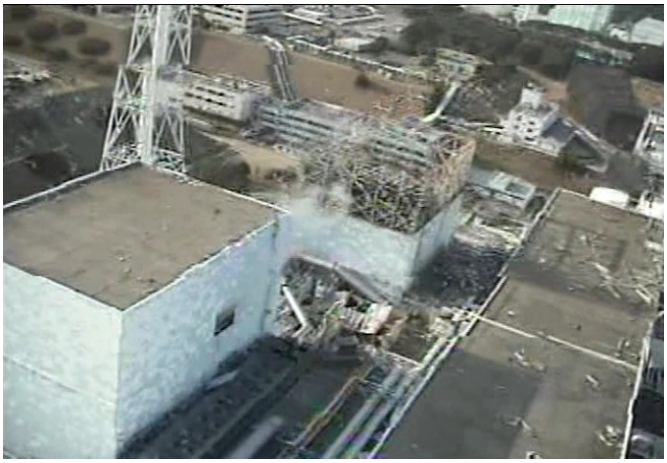
[3] In 1992 International Atomic Energy Agency (IAEA) and Organization for Economic Cooperation Development/Nuclear Energy Agency (OECD/NEA) established the International Nuclear Event Scale(INES), which is an evaluation scale concerning nuclear accidents or breakdowns. Eight levels from 0 to 7 are set for the scale. Level 7, the worst level, means large-scale diffusion of radioactive materials with effects on natural environment and peoples' health across wide areas. It requires planning and execution of wide-scale countermeasures. In the past, level 7 was applied to the nuclear accident in Chernobyl in 1986.

Fukushima Daini Nuclear Power Station. The government of Japan issued a warning to residents around the nuclear power stations. The government directed the evacuation of residents living within a 20-kilometre radius from the Fukushima Daiichi Nuclear Power Station and within a 10-kilometre from the Fukushima Daini Nuclear Power Station. Residents within a 20-to-30-kilometre radius of the Daiichi Power Station were asked to go to shelters inside buildings or to evacuate voluntarily. Furthermore, since April 11 (one month after the earthquake) officials have shown a plan for people to evacuate within about a month from areas where radiation level went high. In April 22, based on Act on Special Measures Concerning Nuclear Emergency Management, the government designated areas within a 20-kilometre radius from the Daiichi power station, a "caution zone" and made them basically off-limits. In addition, an evacuation zone around the Daini Nuclear Power Station was decreased to an area with an 8-kilometre radius.

These areas and their neighboring areas were affected by a complex disaster, a combination of an earthquake, a tsunami, and serious nuclear accidents.

TEPCO Fukushima Nuclear Power Stations had supplied 15% of the electric power in the TEPCO jurisdiction area, in which the Tokyo metropolitan area is included. Consequently, the accidents not also threatened local livelihood in Fukushima, but, due to the short supply of electricity, also affected other regions including the Tokyo metropolitan area.

15: Accidents at the TEPCO Fukushima Daiichi Nuclear Power Station



Source: TEPCO

Column - Concrete Pumps Utilized to Cool down TEPCO Fukushima Daiichi Nuclear Power Station

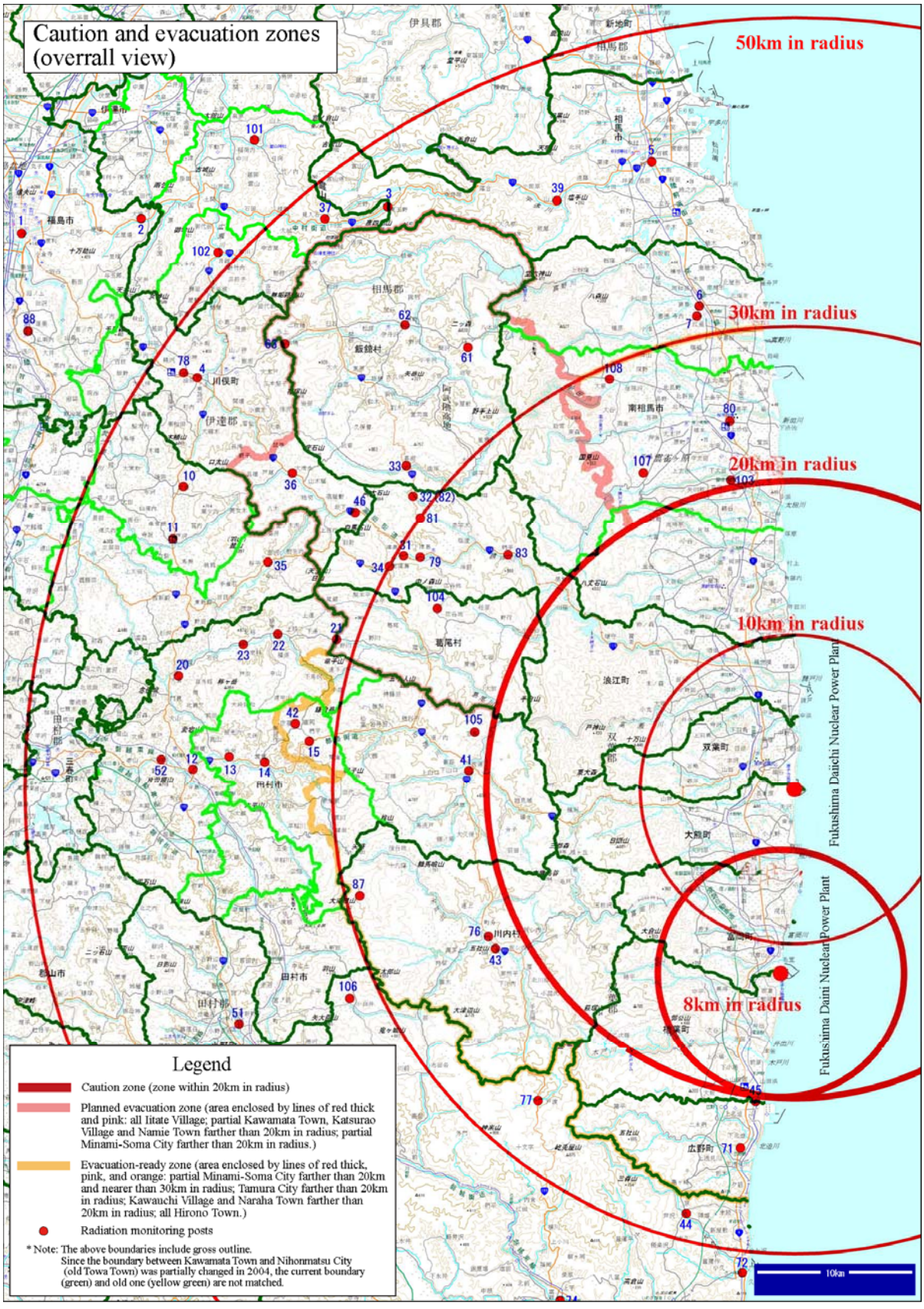
Tokyo Electric Power Company’s (hereinafter called TEPCO) Fukushima Daiichi nuclear power station, where an explosion occurred, urgently needed a means to cool down the pool of used nuclear fuels in order to prevent radioactive material from spreading. While various measures were taken by police, fire services, and the Japan Self Defense Forces, it was decided that concrete pumps owned by construction companies would be used to spray water quickly and immediately on the premises where there was high radioactivity.

Chuo-Kensetsu in Yokkaichi, Mie, and Marukawa-syouji in Ena, Gifu, provided a total of 4 concrete pumps. Construction machinery companies in China also donated such vehicles.

Normally, a concrete pump is used for pumping concrete at building sites. However, the machine greatly contributed to cooling down the nuclear plant during an urgent situation.

Source: TEPCO (left), Marukawa-syouji (right)

16: Caution and evacuation Zone in the Accidents of the TEPCO Fukushima Nuclear Power Stations



Source: Geospatial Information Authority of Japan, as of April 26,2011.

2. Overview of the Unprecedented Large-Scale Damage

In the Great East Japan Earthquake, damages were widespread, caused not only by the massive quake and the huge tsunami, but also by the subsequent aftershocks, land subsidence, ground liquefaction, sediment catastrophe, and fires. Nuclear accidents made the disaster even more complex, creating a situation unprecedented in Japanese history. As a result, it has been extremely difficult to grasp the affected situations. Even at this moment, the whole picture has not been clarified.

Devastating Damage to Towns

Among the damaged areas are many towns located along the Pacific coast that were hit by the big tsunami and suffered catastrophic damages.

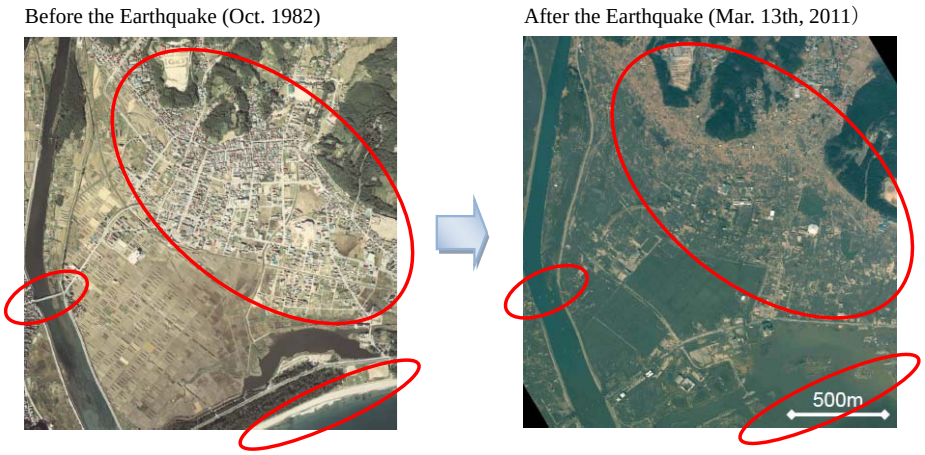
The damage condition survey conducted by MLIT concluded that, as of August 4, in 62 municipalities in six prefectures (Aomori, Iwate, Miyagi, Fukushima, Ibaraki, and Chiba), inundated built up areas were about 119 square kilometers out of the total inundated areas (532 square kilometers). It also affirmed that the areas where many buildings were fully demolished (including those that were flooded) was about 99 square kilometers while the areas where many buildings were nearly collapse or half collapse was about 58 square kilometers. This extraordinary scale of devastation in built up areas can be made clearer when compared to the area of 35 square kilometers lost to fires in the Great Kanto Earthquake and area of 2.6 square kilometers that was rezoned in land-readjusting project after the Great Hanshin-Awaji Earthquake. A big difference of building damage level exists above and below two meters in inundation height. It was observed that a percentage of fully-damaged buildings to the total buildings greatly reduced when inundation height was below two meters.

Inundation data by municipality shows that devastating damages are widespread in Noda Village and Rikuzen-Takata City in Iwate, and Minami-Sanriku Town and Higashi Matsushima City in Miyagi, where more than 80% of the built up land was inundated.

17: District that Suffered Catastrophic Damages from the Great East Japan Earthquake

Around Rikuzen-Takata City

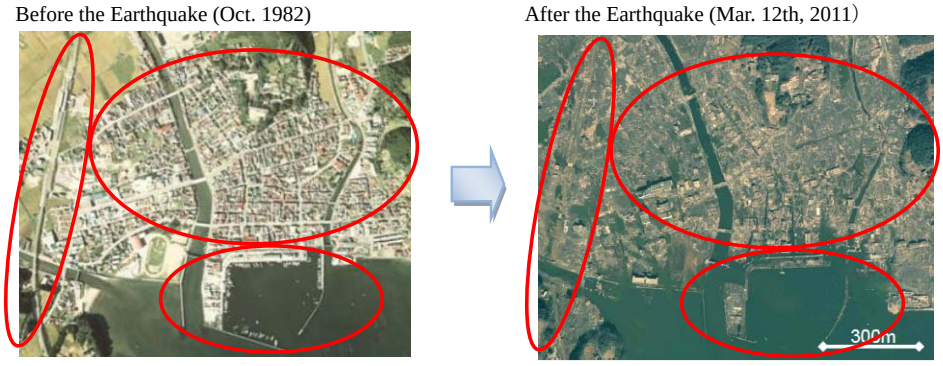
Before the Earthquake (Oct. 1982) / After the Earthquake (Mar. 13th, 2011)



* Many buildings were flooded; shore protection facilities and transportation infrastructures were severely damaged.

Around Minami-Sanriku Town

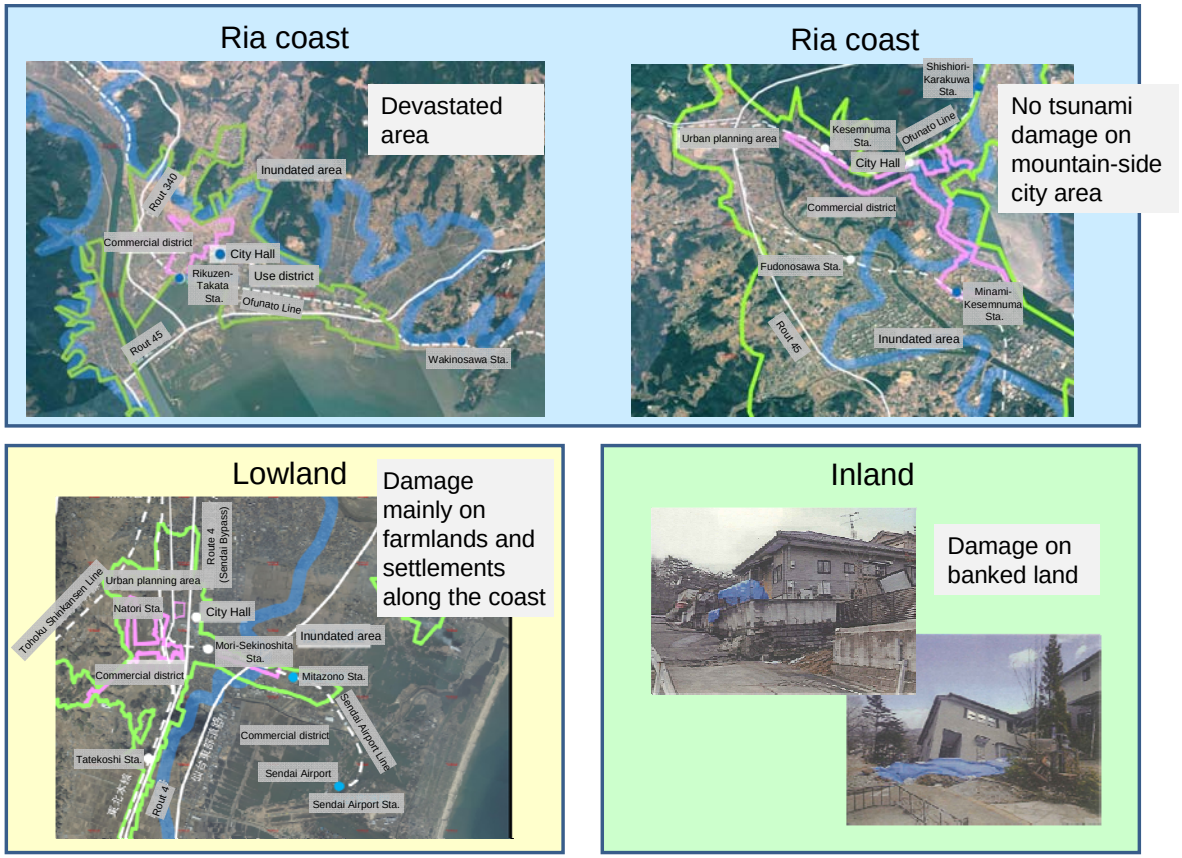
Before the Earthquake (Oct. 1982) / After the Earthquake (Mar. 12th, 2011)



* Many buildings were flooded; shore protection facilities and transportation infrastructure were severely damaged.

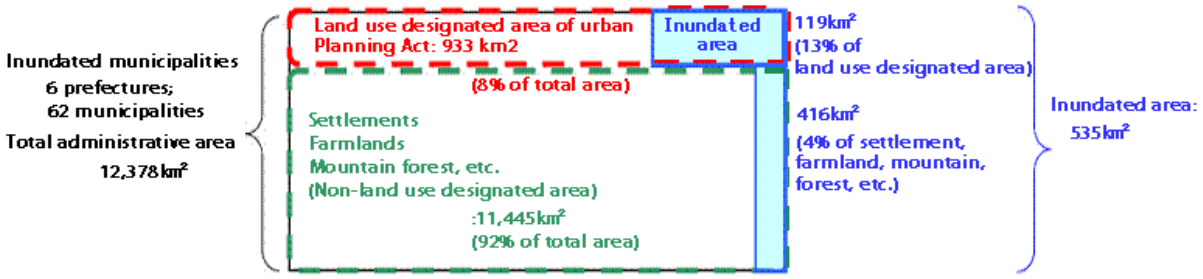
Source: MLIT from documents of GSI

18: Damages Varying by Districts in the Great East Japan Earthquake



Source: MLIT

19: Inundated Area in the Great East Japan Earthquake



Source: MLIT

The Sanriku-coast area has repeatedly experienced massive disasters -- earthquakes and subsequent tsunamis, such as the Meiji-Sanriku earthquake in 1896, the Showa-Sanriku earthquake in 1933, and the Chile earthquake in 1960. The area has therefore passionately carried out disaster drills and education, with its residents sharing a strong awareness of disaster prevention and making use of the severe lessons learned from the past. However, the massive tsunami caused by the Great East Japan Earthquake exceeded the severity of previous disasters substantially, swallowing up houses, buildings, ships, and automobiles.

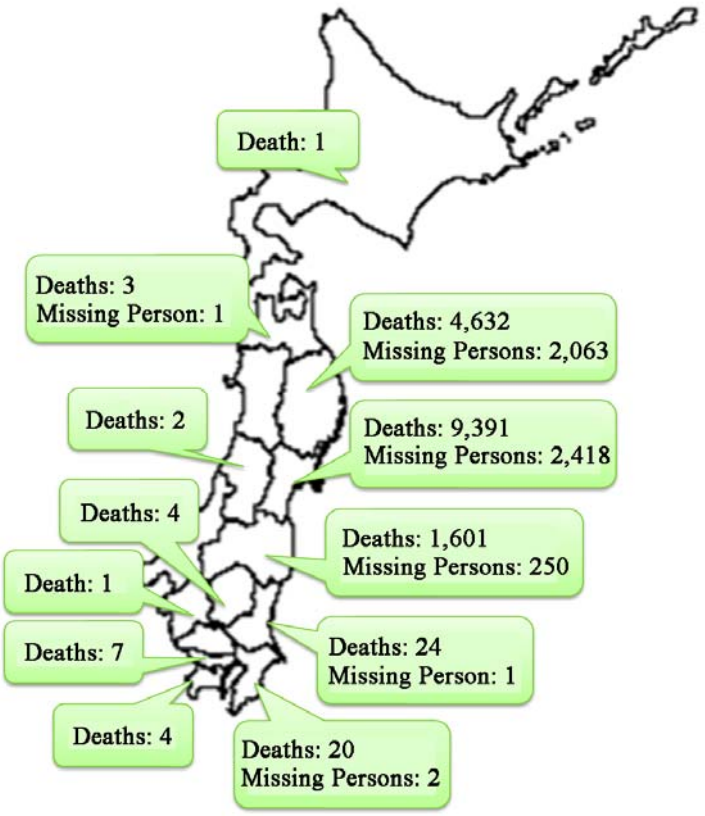
In the municipalities where whole towns were devastated (for example, the town of Minami-Sanriku in Miyagi, where the city government building itself was flooded by the tsunami), administrative functions to manage and control disasters at the front line were greatly damaged. Consequently, there were great difficulties to grasp damages and to carry out immediate rescue activities.

Many Evacuees and People Afflicted in a Large Area

The Great East Japan earthquake killed 15,690 people across 12 prefectures (as of August 11).[1] The number of deaths greatly surpasses that of the Great Hanshin-Awaji Earthquake and is the highest since the end of the Second World War. It has been reported that there are still 4,735 missing people, but that figure has not yet been clarified.

More than 99 percent of the dead and missing were from the municipalities along the Pacific coast in Iwate, Miyagi, and Fukushima prefectures. This shows us how massive the tsunami damage was.

20: The Number of Deaths or Missing Persons by Affected Prefectures in the Great East Japan Earthquake



Note: As of August 11th.
Source: MLIT, based on materials of National Police Agency.

21: Seismic and Tsunami Damage in Japan since 1868 (Meiji Era)

Year	Earthquake Name	The number of Casualties (Including Rough Figures)
1923	Great Kanto earthquake*	105,000
1896	Meiji-Sanriku earthquake*	21,959
2011	Great East Japan Earthquake*	20,425
1891	Mino-Owari earthquake	7,273
1995	Great Hanshin-Awaji earthquake	6,437
1948	Fukui earthquake	3,769
1933	Showa-Sanriku earthquake*	3,064
1927	Tango earthquake	2,925
1945	Mikawa earthquake	2,306
1946	Nankai earthquake*	1,330

Notes: 1. * denotes earthquakes in which a tsunami caused severe damages.
2. The number of casualties from the Great East Japan Earthquake is as of August 11, 2011.

Source: MLIT

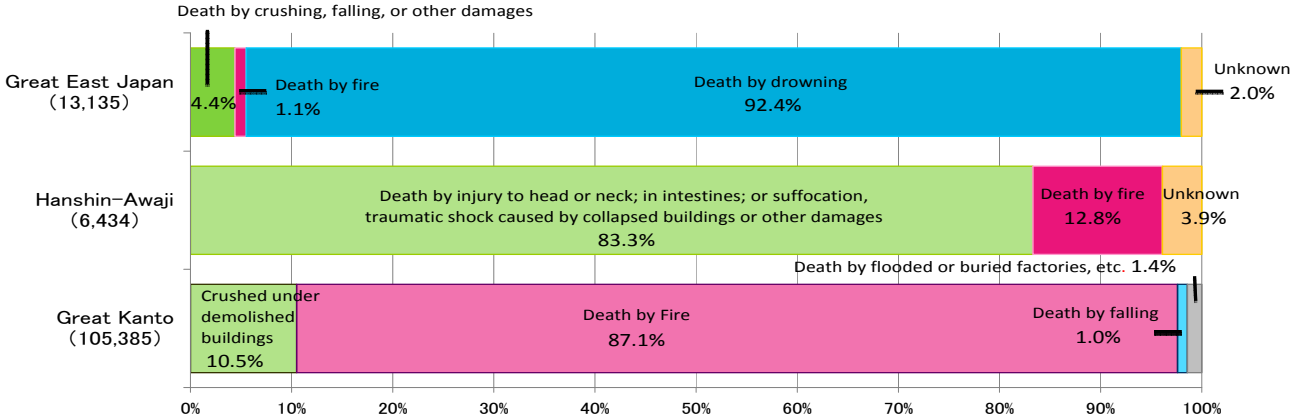
[1] Including the deaths due to the aftershocks of April 7 (the epicenter of which was off the coast of Miyagi prefecture) and of April 11 and 12 (the epicenter of which was Hamadori in Fukushima prefecture).

22: Significant Damage from Earthquakes and Tsunami Worldwide since 1900

	Earthquake Name	Principle Affected Area	Casualties (rough figures included)
1976	Tangshan	China (Tianjin – Tangshan)	242,800
1920	Haiyuan	China (Ningxia Hui Autonomous Region)	235,502
2004	Sumatra-Andaman	Sri Lanka, Indonesia, Maldives, India, Thailand, Malaysia, Myanmar, Seychelles, Somalia, Tanzania, Bangladesh, Kenya	227,898
2010	Haiti	Haiti	222,500
1923	Great Kanto	Japan (Kanto area)	105,000
2008	Sichuan	China (Sichuan)	87,587
2005	Kashmir	Pakistan, India, Afghanistan	86,000
1908	Messina	Italy (Sicily)	82,000
1927	Gansu, China	China (Gansu)	80,000
1970	Peru	Peru	66,794

Source: MLIT based on materials of the Japan Meteorological Agency and the Cabinet Office

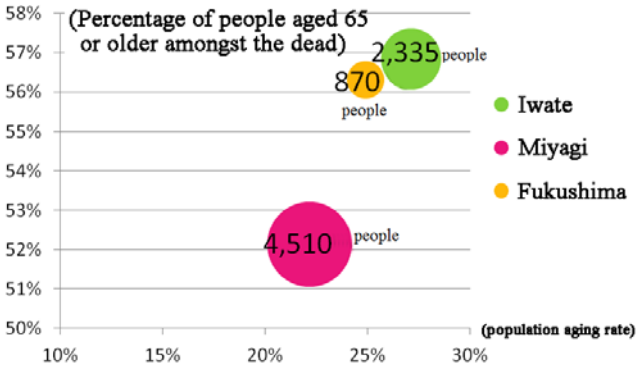
23: Causes of Death in the Big Earthquakes



Note: The number of deaths in the Great East Japan Earthquake is the one recorded until April 11, 2011.
Source: MLIT based on materials of National Police Agency and "White Paper on Disaster Management 2011" of Cabinet Office.

Furthermore, 54 percent of the dead were elderly people (65 years old or older). The high-speed tsunami hit areas with large elderly populations who could not evacuate quickly enough. Consequently, the number of victims during the disaster increased.

24: Rate of Aging in the Affected Prefectures and the Number of Elderly Among the Dead in the Great East Japan Earthquake



Note: The size of circles and the numbers therein show the number of elderly people killed, recorded until August 11, 2-11.
Source: MLIT based on materials of National Police Agency and prefectures of Iwate, Miyagi, and Fukushima.

Column - Huge Tsunami Hit Even Designated Shelters

Each municipality designates public facilities such as schools or public halls as shelters, where people can go to protect themselves from disasters like an earthquake or a tsunami. However, after the Great East Japan Earthquake, huge waves surged toward many of those shelters.

Nobiru Elementary School was one of the designated shelters of Higashi-Matsushima city, Miyagi, and it was safe when a big tsunami hit the area as a result of the Chile Earthquake. The city did not include it in the evacuation area in the tsunami hazard map (as an area that might be inundated). Consequently, not only school children but also neighborhood residents evacuated to the gymnasium of the school, which was destroyed by the massive tsunami.

We have to research these tragic situations to reinforce countermeasures against tsunamis, and to prevent this kind of tragedy from happening again.

Source: MLIT from documents of Higashi-Matsushima City, Miyagi

Column - Evacuation Stairs Saved 88 School Children

Iwaizumi Town, Iwate suffered devastating damage as a result of the huge tsunami caused by the Great East Japan Earthquake. However, 88 children were saved thanks to tsunami evacuation stairs which had been built 2 years ago at Omoto Elementary School.

Although Route 45 crosses behind it, the building is almost enclosed by cliffs where people can't evacuate once a tsunami hits the school. In emergency drills taking place at the school, some children had suggested that a safer evacuation route should be developed.

Listening to the suggestion and the opinions of the elementary school and neighborhood residents, the Sanriku National Road Office of the Tohoku Regional Bureau (Ministry of Land, Infrastructure, Transport and Tourism) completed the evacuation stairs (130 steps, 30m long).

Source: Iwaizumi Town, Iwate (left); MLIT (right)

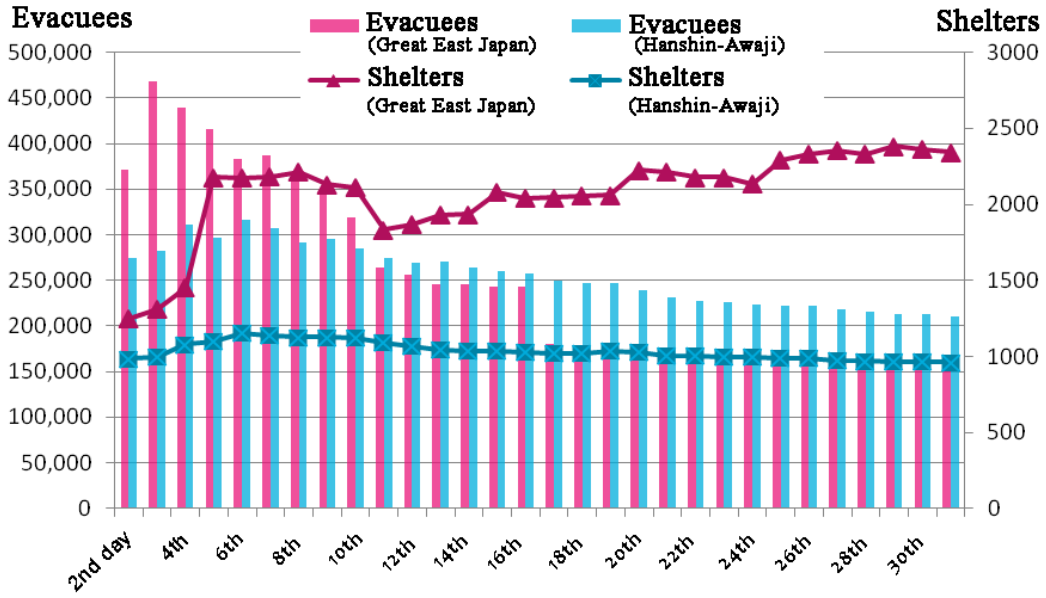
The Great East Japan Earthquake resulted in the evacuation of many people across wide areas due to housing loss by the earthquake, the tsunami, and the nuclear plant accidents. As many as 468,000 evacuees were reported 3 days after the main shock (March 14), 1.5 times more than the number of evacuees during the Great Hanshin-Awaji Earthquake. Moreover, the number of shelters needed was more than twice of that during the Great Hanshin-Awaji Earthquake.

Minami-Sanriku Town in Miyagi, where the tsunami caused severe damages, promoted group evacuation to neighboring municipalities based on the will of residents. Futaba Town in Fukushima, which had received evacuation directions due to nuclear accidents, moved administrative functions of its local government and about 1,400 of its residents, almost 20 percent of the total population into Saitama prefecture. Including Futaba Town, eight towns and villages moved their administrative functions to other places and evacuated their residents out of their municipalities -- or even prefecture -- into other prefectures across Japan.

Even on July 28, more than 4 months after the shock, approximately 52,000 residents were still living in shelters and other relocated places[1].

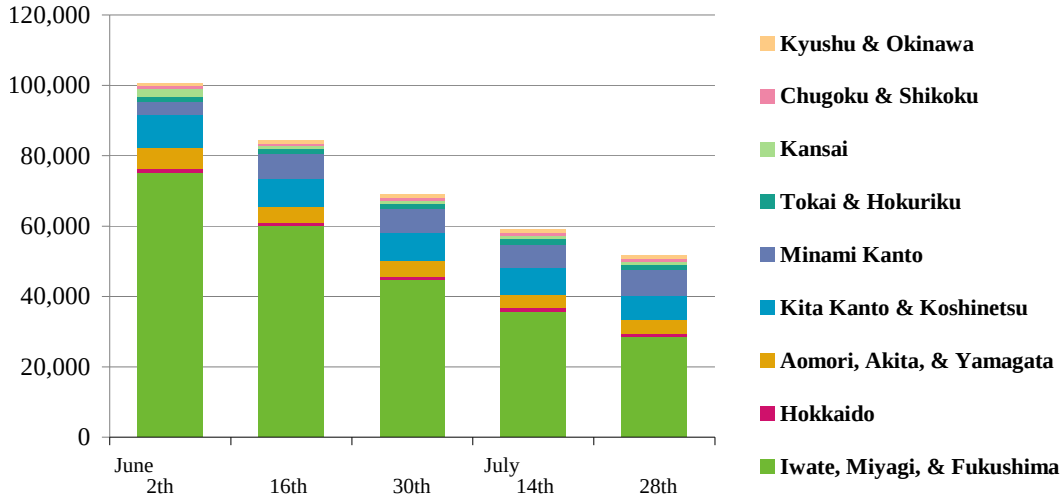
[1] The data is from the Cabinet Office survey on the number of evacuees (excluding evacuees to other housing). The National Police Agency announced the number of evacuees into shelters on a daily basis immediately after the earthquake. Since June 2, with cooperation from each municipality, the Cabinet Office has figured out and publicized the number of evacuees by prefectures and shelters every 2 weeks.

25: Trend of the Number of Evacuees in the Great East Japan Earthquake (Compared to the Great Hanshin-Awaji Earthquake)



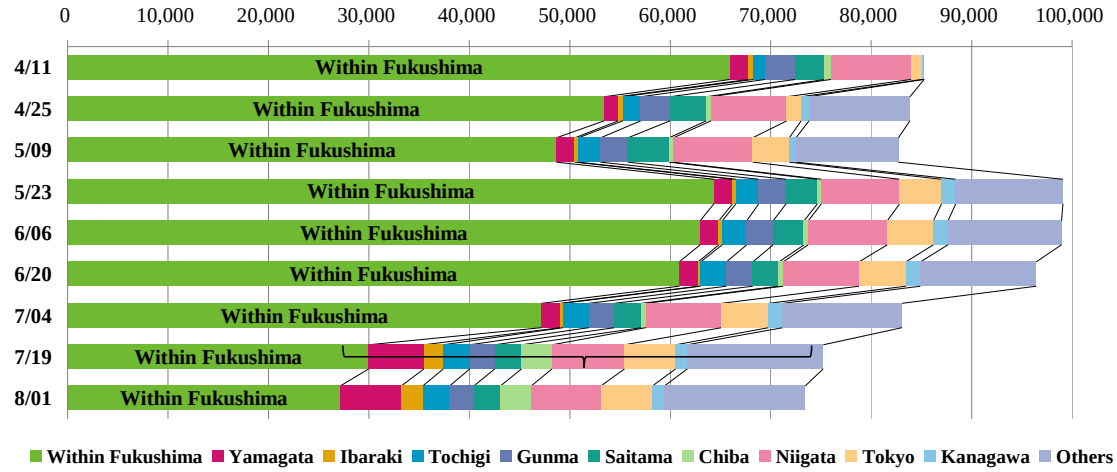
Note: The values recognizable at that moment.
Source: MLIT based on materials of National Police Agency and Hyogo Prefecture

26: Great East Japan Earthquake evacuees spread across wide area and over long term



Note: The values depend on the ones reported by each prefecture to the Cabinet Office, and do not include the number of evacuees in houses (public, temporal or civil residences, hospitals, etc.)
Source: MLIT from documents of the Cabinet Office

27: Evacuation of Fukushima Prefecture Residents



Note: Total of evacuees who followed evacuation directives and calls, and who voluntarily evacuated (including evacuees who were not in shelters).
Source: MLIT based on materials of Fukushima Prefecture.

Damage on Housing and Infrastructures

The Great East Japan Earthquake caused outstanding physical damages, including not only breakdown of lifelines such as electricity, gas, water, and telecommunication, but also damages on housing and buildings, landscapes, transportation, and other life-supporting infrastructures.

Those damages are overviewed hereinafter. However, information about the areas devastated by the tsunami and the areas surrounding the TEPCO Fukushima nuclear power stations where the government issued directions for resident evacuation is partially missing.

i) Damages on Housings and Buildings

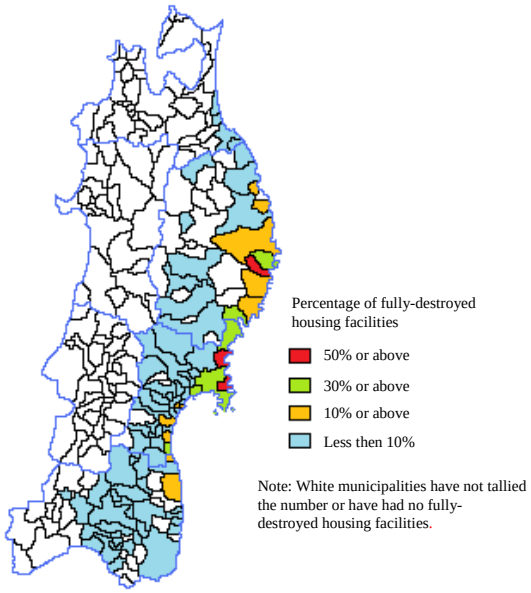
The Great East Japan Earthquake resulted in approximately 112,975 fully-demolished housing, 145,375 half-collapsed housing, and 539,899 partially-collapsed housing[1].

The earthquake also caused damages to 45,416 non-residential buildings. Public buildings such as municipal offices, schools, and hospitals were also severely damaged.[2]

Minami-Sanriku Town in Miyagi was severely damaged by the tsunami, with more than 60 percent of its housing reported to have been fully-damaged.

The earthquake and tsunami brought about not only flooding and collapse of buildings, but also the collapse of ceilings in large buildings such as gymnasiums and airports.

28: Damage on Housing (by Municipalities) in the Great East Japan Earthquake



Notes: 1. The data is as of August 11, 2011. MLIT took the number of households in the Population Census (2010) as the total number of housing for the municipalities which had no data on the total number of housing in the Housing and Land Survey (2008).
2. MLIT included half-destroyed housing in “fully destroyed housing” in Ofunato, Iwate and half- and partially-destroyed housing in it in Otsuchi Town, Iwate.
Source: MLIT based on materials of Fire and Disaster Management Agency, "Housing and Land Survey 2008" and "National Population Census (population census) 2010" of Ministry of Internal Affairs and Communications.

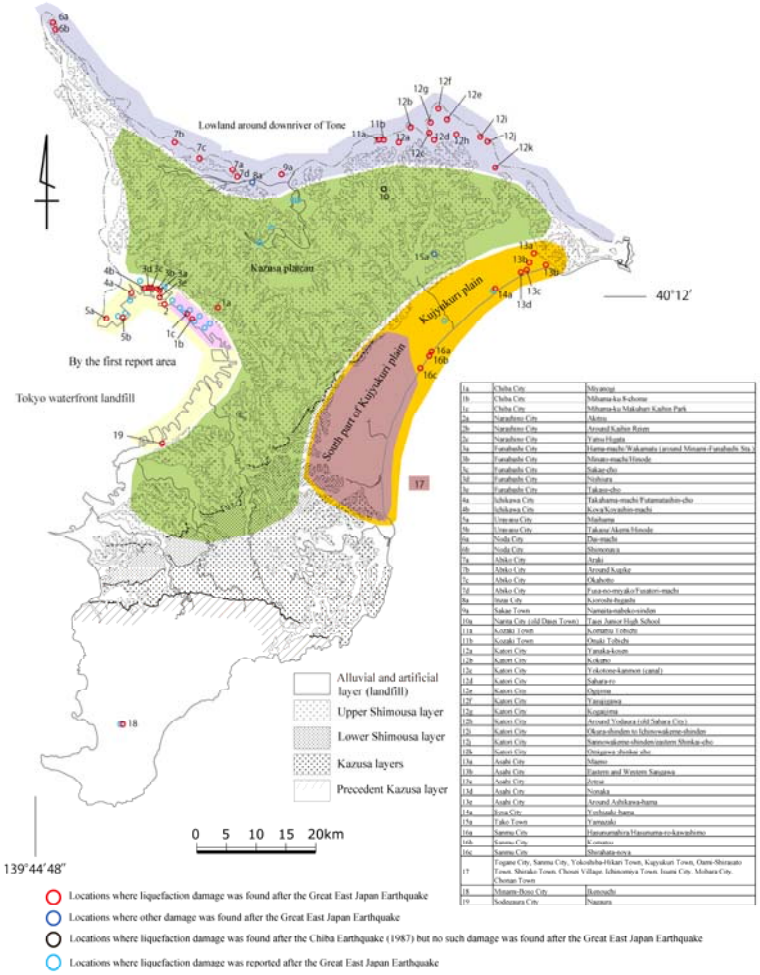
[1] Surveyed by the Fire and Disaster Management Agency (as of August 11).
[2] Surveyed by the National Police Agency (as of August 11).

29: Damages by Liquefaction due to the Great East Japan Earthquake



Sources
Left: "Report on Seismic Damages of the Great East Japan Earthquake by Investigation Team of Japan Society of Civil Engineering" (Osaki City, Miyagi)
Center: Urayasu City, Chiba
Right: Abiko City, Chiba

30: Damaged Locations by Liquefaction in the Great East Japan Earthquake (in the case of Chiba prefecture)



Source: Chiba Environment Research Center

In order to prevent secondary damege by aftershocks and other causes, risk levels of 95,381 damaged buildings, including risks of collapse, were urgently checked in 149 municipalities in 10 prefectures. The result as of August 11 was that 11,699 buildings were judged as “being dangerous to enter” and 23,191 buildings were evaluated as “needing caution to enter”.

The long and strong shaking during the main shock and the following aftershocks caused landslides in large-scale embankments of development sites. The results of a survey of risk levels of 6,531 housing sites, carried out in 56 municipalities in nine prefectures, shows that 1,456 housing sites were judged to be “ dangerous” and 2,209 sites were judged as "needing caution" (as of August 7). Numerous landslides occurred at relatively old housing development sites along hilly slopes. Consequently, many residents were forced to evacuate

from those sites.

Furthermore, liquefaction occurred in wide areas, extending from Tohoku to Kanto regions, including the Tokyo Bay area[1]. It occurred not only in areas such as reclaimed lands where the possibilities of liquefaction was recognized to be high, but also in inland areas including Saitama and Chiba prefectures and areas along the Tone River. The liquefaction made the ground weaker and caused many damages such as leaning in houses[2].

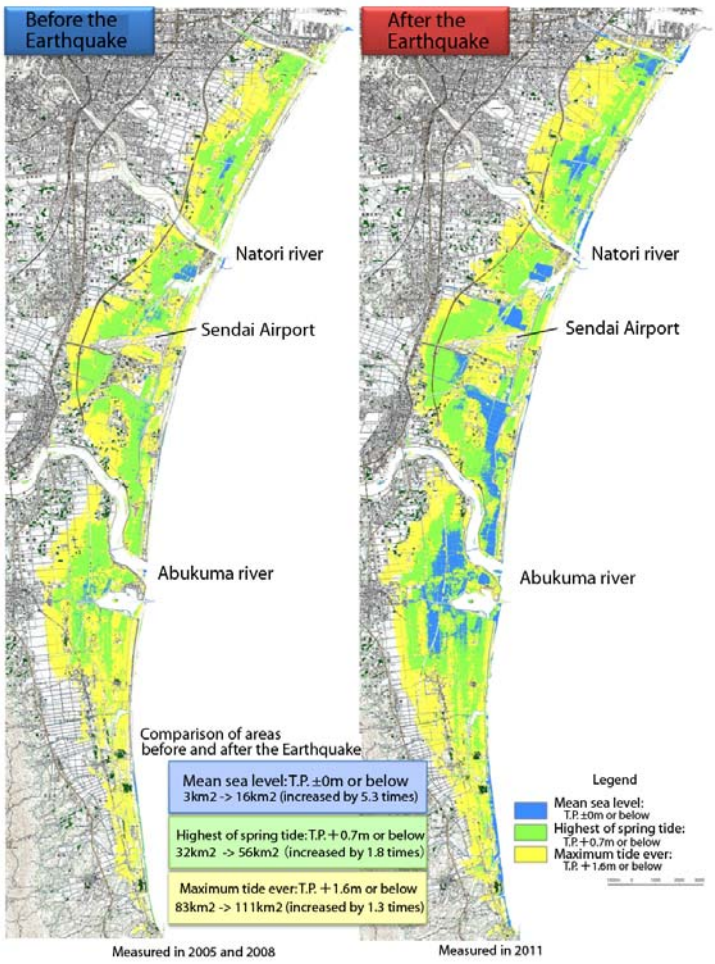
ii) Damages on Coast , River and Sediment

The massive earthquake and the accompanying crustal movement caused widespread land subsidence in areas including the coastal area and the inland of the Sendai Plain[3]. For example, in the Sendai Plain, the area below average sea level increased by 5.3 times to 16 square kilometers; the area below spring high tide increased by 1.8 times to 56 square kilometers; and the area below the recorded highest sea level increased by 1.3 times to 111 square kilometres.[4] Moreover, the collapse of sea levees and erosion of sand dunes significantly decreased safety levels against tidal waves.

A brief survey based on aerial photos confirmed that out of 300 kilometers of coast levees in Iwate, Miyagi and Fukushima prefectures, about 190 kilometers of levees were fully or half destroyed.

In the area along Sanriku coast, the height of developed sea levees had been planned based on inundation heights of past massive tsunamis. In the Pacific coast area extending from Sendai Plain to Fukushima prefecture, the height of developed sea levees had been planned based on expected high tides. However, comparing the levee heights with the tsunami traces measured near levees, the massive tsunami of this time was much higher than the levee heights, mostly on all the coasts, with the exception of a few, including Fudai Coast in Iwate. Consequently, its extraordinary pressure destroyed or damaged the levees.

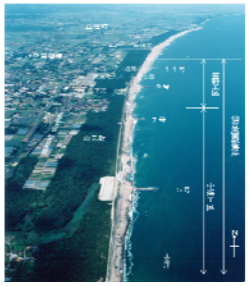
31: Land Subsidence Across the Sendai Plain After the Great East Japan Earthquake



Source: MLIT and Miyagi Prefecture.

32: Damage from the Great East Japan Earthquake along Coastal Areas (South Coast of Sendai Bay)

Before the earthquake



After the earthquake

Source: MLIT

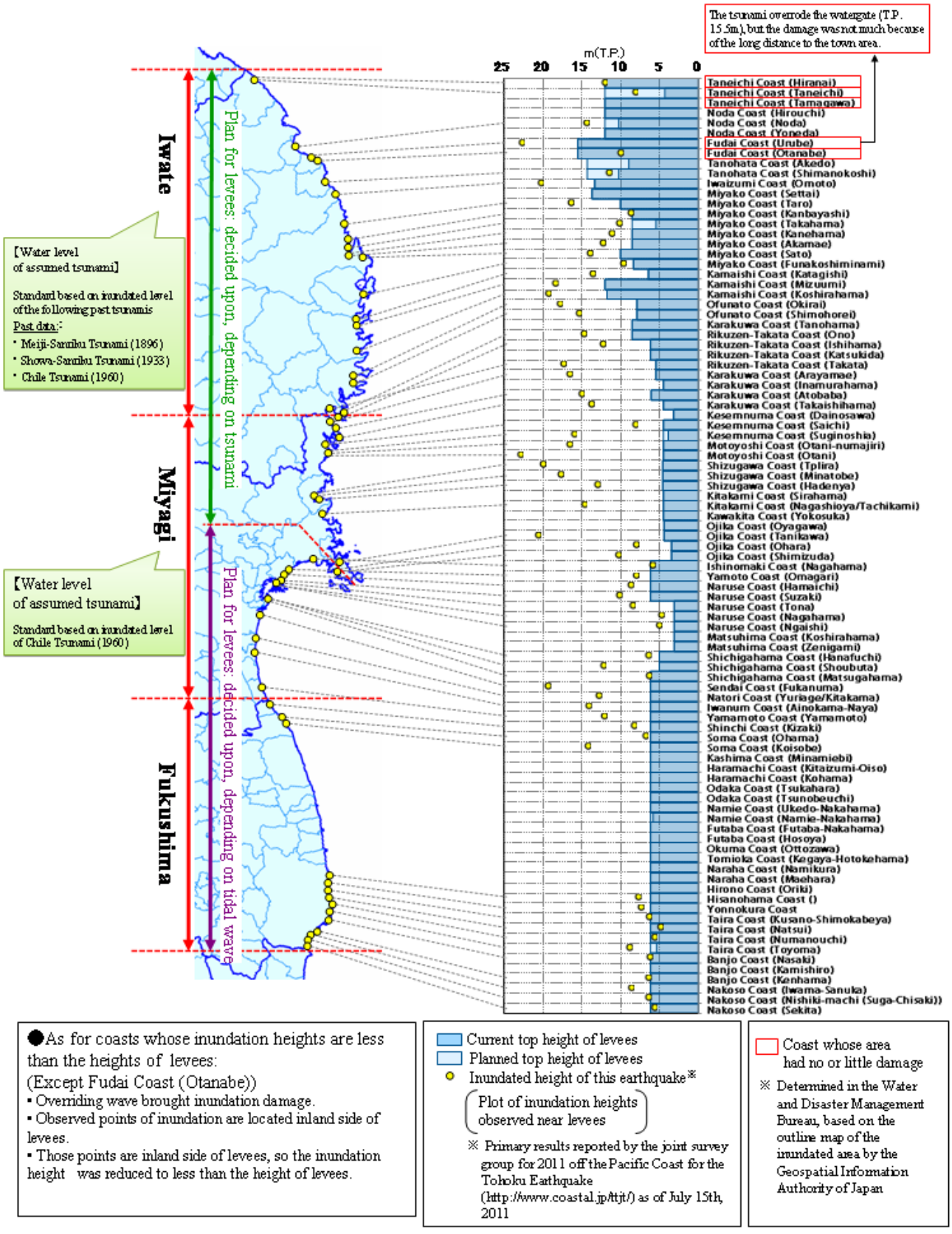
[1] Damages caused by liquefaction have been reported in nine prefectures extending from the Tohoku to the Kanto regions (Iwate, Miyagi, Fukushima, Ibaraki, Gunma, Saitama, Chiba, Tokyo and Kanagawa). Among them, liquefaction in housing sites have been confirmed in Kitakami City of Iwate, Tone Town and Itako City of Ibaraki, Kuki City in Saitama and in 16 municipalities in Chiba (as of August 8).

[2] Since many housing was damaged due to liquefaction caused by the Great East Japan Earthquake, on May 2, the Cabinet Office reviewed the operation guidelines regarding the standard of evaluating housing damage.

[3] Geospatial Information Authority of Japan's emergent survey on land subsidence in part of Pacific coast areas in Iwate, Miyagi and Fukushima prefectures affirmed land subsidence, the scale of which was from 20 centimeters to utmost more than 80 centimeters. (For example, 84 centimeters in Rikuzen-Takata City of Iwate, 78 centimeters in Ishinomaki City of Miyagi)

[4] MLIT announced the data on April 28 after grasping land level of Sendai Plain based on information including aerial laser measurement and summing up the relations between land and sea levels. The average sea level is one of Tokyo Bay (T.P.±0m), spring high tide is mean synodic high tide (T.P±0.7m), and the recorded highest sea level is statistical value of Sendai-Shinko tide observatory from 1980 to 2010 (T.P±1.6m).

33: Rationales of Planned Levee Top Heights and Inundated Heights of Tsunami Caused by the Great East Japan Earthquake



Source: MLIT

2,115 points along nationally managed rivers, including the Kitakami River and the Tone River, were observed to be damaged due to levee breaks or massive embankments falling. 1,360 damaged points in locally managed rivers have also been reported. Reasons for many and widespread damages on river levees are not only fast acceleration of seismic vibration in the Pacific coast areas in Tohoku region, but also long duration thereof in the Tohoku and Kanto regions.

Not only were deformations through liquefaction of crustal foundation observed as expected, but also the unexpected deformation via partial liquefaction of embankment, were confirmed. It is necessary to reconsider anti-seismic capacity of levees and to discuss the promotion of countermeasures based on the knowledge obtained from this disaster.

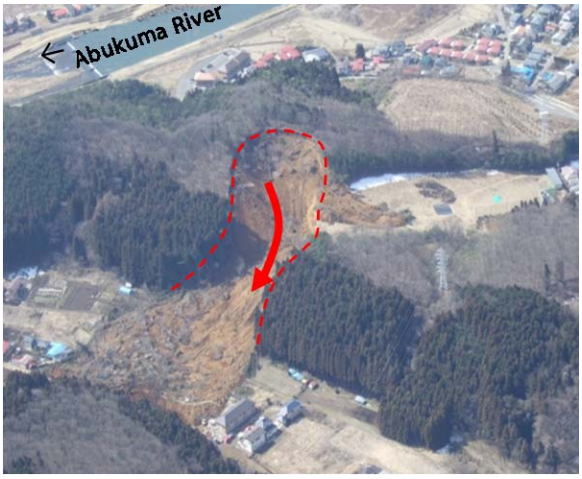
34: Damage from the Great East Japan Earthquake to Rivers

Left: Kitakami River (breached levee)
Right: Edo River (liquefaction)

Source: MLIT

136 cases of sediment disaster happened in twelve prefectures, including Iwate, Miyagi and Fukushima. 19 people were killed, and many landslides on hillsides were observed as well.

35: Sediment Disaster due to the Great East Japan Earthquake (Hanokidaira, Shirakawa City, Fukushima)



Source: MLIT

iii) Damage on Transportation Infrastructures

Fifteen expressways, 69 sections of nationally managed national roads, 102 sections of prefecturally managed national roads, and 540 sections of prefecture roads were closed due to damages that included flooded and collapsed bridges.[1] Road damages were especially severe in the Pacific coast areas centered in the Tohoku region, including National Road 45 which runs vertically from Sendai City in Miyagi and across Sanriku coast areas. Many sections of national and prefectural roads became impassable.

36: Damage from the Great East Japan Earthquake to Roads

Left: Tohoku Expressway, Fukushima Iizaka IC – Kunimi IC
Center: Route 45, Kamaishi City, Iwate
Right: Miyagi Preferectural Road, Ishinomaki-Onagawa Line, Hiyori Bridge

Source: East Nippon Expressway (left); MLIT (center); Miyagi Prefecture (right)

[1] Including damages by earthquakes of April 7 (the epicenter was off the coast of Miyagi) and April 11 (the epicenter was Hamadori in Fukushima).

Column - Embankment Structure of Sendai Tobu Highway Saved Many Lives

In the Great East Japan Earthquake, many roads were badly affected, but some roads played essential roles in saving local residents when the huge tsunami occurred. Sendai Tobu Highway goes through coastal areas of Sendai City, Miyagi from south to north, passing by Wakabayashi Ward in the city that was demolished by the massive tsunami. Its structure consists of an embankment of 7 to 10m higher than the area around it. In the Rokugo District of Wakabayashi Ward (near the mouth of the Natori River) is wide flatland, so there is no higher ground except for the road. Many residents quickly ran up the side slopes of the road to escape from the tsunami descending upon them.

230 people who evacuated to the road between Sendai Wakabayashi Junction and Natori Interchange narrowly escaped. Moreover, there were obvious differences in the damage to both areas between it. Sendai Tobu Road fulfilled two functions: higher ground for evacation and coastal levee.

Some residents had requested to have the road designated as an emergency evacuation area even before the disaster. It will be necessary to discuss the role of roads that can be used as countermeasures against tsunamis.

Source: MLIT

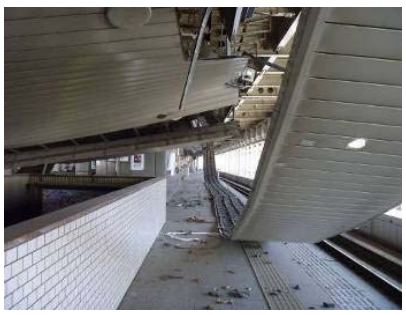
Railways were also severely damaged. The Shinkansen lines of Tohoku, Akita, and Yamagata were affected, especially those operating along the Pacific coast which lost station buildings and rails by flooding. As of 15:00 on March 13 -- 48 hours after the shock -- 64 lines of 22 business operators were forced to stop their operations. While the inland-running Tohoku Shinkansen and Tohoku Line resumed operation in mid-April, railways along the coast, with the exception of a few, have still not seen any prospect of restoration.

Reflecting on the damages caused by the Hanshin-Awaji Earthquake and the Mid-Niigata Earthquake, Shinkansen introduced countermeasures for earthquakes, including stricter and strengthened earthquake-resistance standards for civil structures such as elevated bridges, reinforced anti-seismic capacity of existing buildings, introduction of emergency train stoppage system, and installment of equipment to reduce derailment damages. Although there was breakage of power poles and damage of wires, there were, thanks to the above measures, no serious damages such as injury of passengers and collapse of elevated bridges.

37: Damage from the Great East Japan Earthquake to Railroads

Premises of Sinchi Station, Tokiwa Line

Platform of Sendai Station, Tohoku Shinkansen



Source: MLIT based on materials of Fukushima Prefecture

38: Damage to Shinkansen from Massive Earthquakes

	Great East Japan	Hanshin-Awaji	Mid-Niigata
Breakout Time	2011.3.11 (Fri) 14:46	1995.1.17 (Tue) 5:46	2004.10.23 (Sat) 17:56
Moment Magnitude (Mw)	9.0	6.9	6.7
Section of Damaged Line	536km (Omiya to Iwate-Numakunai)	83km (Shin-Osaka to Himeji)	65km (Urasa to Tsubame-Sanjo)
Derailment of Running Trains	None	None	1
Casualties	None	None	None
Fallen Bridges	None	8	None
Damage on Pillar of Elevated Bridges	About 100	708	47
Misaligned Breams	2	72	1
Fallen Tunnel Surfaces	None	1	4
Damaged Power Poles	About 540	43	61
Days from the Breakout Day to Resuming Operations	49 days	81 days	66 days

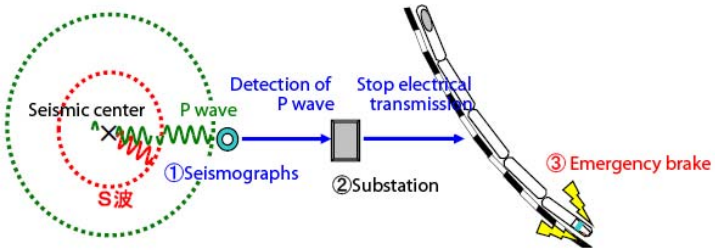
Source: MLIT.

Column - Shinkansen System Secured the Safety of Passengers

For the Shinkansen, not only had seismographs been installed in coastal areas and along operational lines, but a system to have trains slow down and stop before huge earthquake occur was also introduced. Moreover, in light of an accident during which one of the Joetsu Shinkansens in operation derailed during the Mid Niigata Earthquake of 2004, Japan Rallway had also reinforced the system in the Tohoku Shinkansen. In addition, the "Early Earthquake Detection System" has been introduced. It sends signals from seismographs set along Shinkansen lines and along the Pacific Coast areas to stop trains before the main shock arrives.

When the Great East Japan Earthquake occurred, 27 trains were in operation (8 of them were stopped at stations). However, thanks to the system working successfully, all the trains stopped safely. There were no casualties.

The Tohoku Shinkansen has been just extended to Shin-Aomori and started operation in the area on December 4th, 2010. It was expected to contribute as the large artery in the area for further economic and cultural developments. Shortly after, it came to suffer a great hazard, but the fact that no one was injured in such a massive earthquake verified and exhibited the high safety technologies of the Japan Shinkansen system to the world.



①:Seismographs detects profile of P wave and extrapolate a huge earthquake or detects seismic wave over a standard.

②:In the case of above 1, electrical transmission from rail substation is automatically stops.

③:Emergency brake system on a train goes off to have it slow down to stop.

Source: MLIT.

Along the Pacific coast from Hachinohe City in Aomori to Ibaraki prefecture, all the ports, including an international hub port and 10 important ports, suffered devastating damages to their port facilities (for example, their breakwaters, berthing facilities and cargo machines). Moreover, oceanside port facilities such as ship courses and anchorages were buried or blocked by sediments. Also, containers, shipped automobiles, and debris were carried away by the currents. Consequently, all port functions were halted in the afflicted areas, and necessities for livelihood and industry in the Tohoku region as a whole could not be brought in until the ports were temporarily restored.

In addition, 156 facilities, including lighthouses to navigate ships safely, collapsed or became flooded (as of August 11).

39: Damage from the Great East Earthquake to Ports

Sendai Shiogama Port

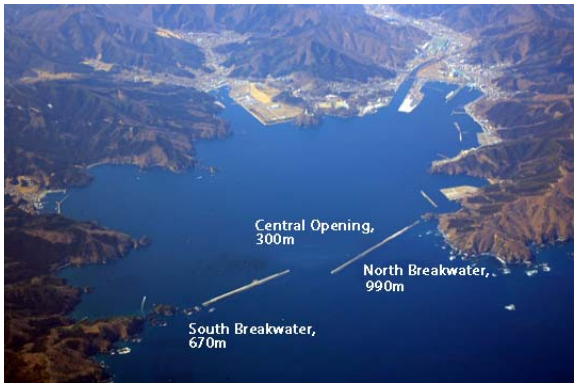
Soma Port

Source: MLIT.

<u>Column - Damage and Import Mitigation Effects of Bay Entrance Breakwater at Kamaishi Port</u>

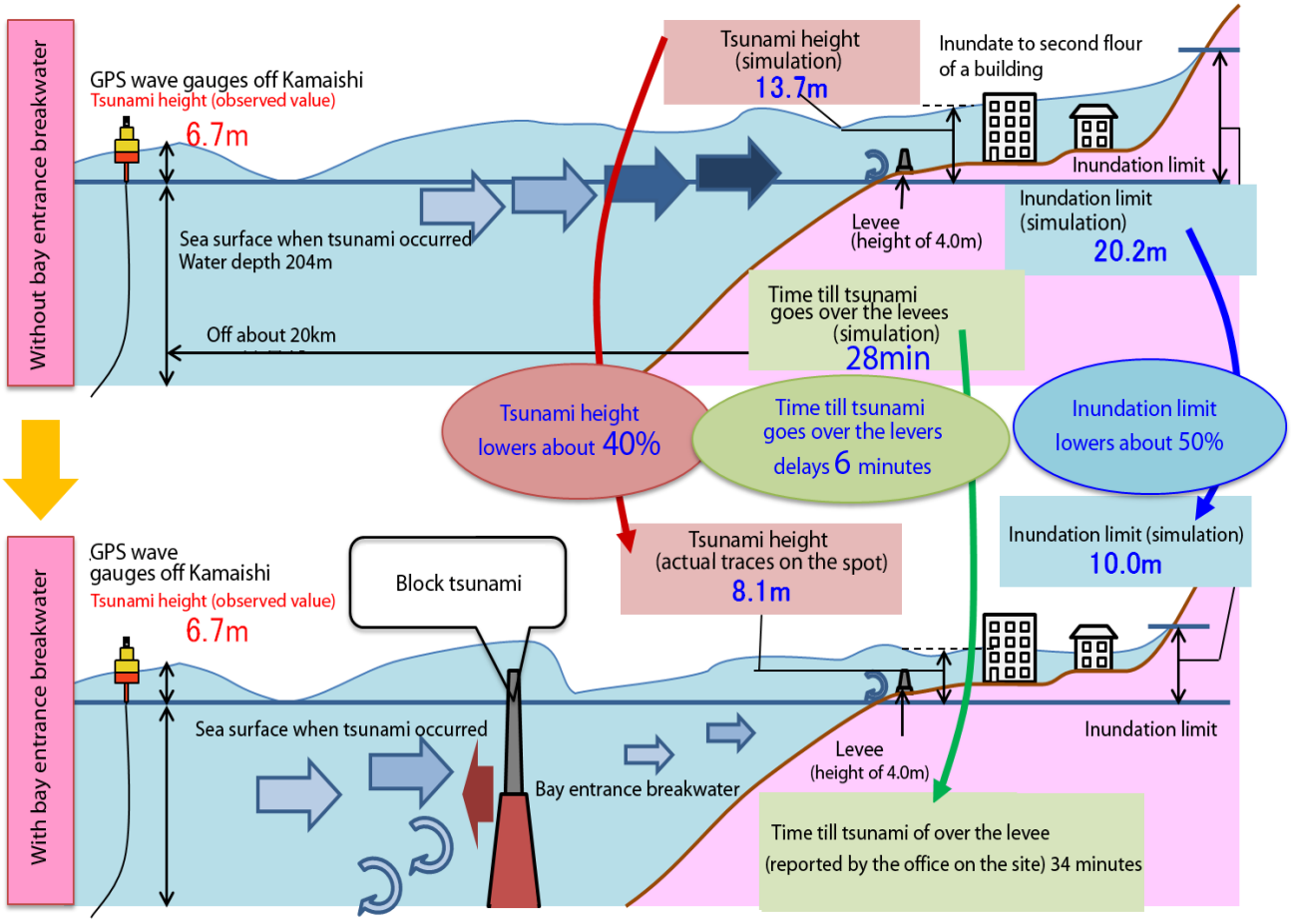
At Kamaishi Port, Iwate, bay entrance breakwaters that are the deepest in the world (63m) were completed in March 2009 after 31 years of construction. A center opening area of 300m is secured for bigger ships, at both sides of which are two breakwaters, North Breakwater (990m) and South Breakwater (670m), which are constructed on a slant. It is expected to make tidal waves equivalent to the Meiji-Sanriku Tsunami lower than the top height of the breakwaters within the bay (roughly 4m), which would prevent inundation in the town.

However, the massive tsunami caused by the Great East Japan Earthquake had unexpected power and largely destroyed the breakwaters. As a result, the tsunami went over the breakwaters within the bay and inundated an area wider than what was estimated by the prepared hazard map. It is necessary to reserch factors of tsunami damages, and to make better use of such knowledge for disaster control. In such reserch processes, it was found that those breakwaters, in comparison to cases where there were no tsunami breakwaters, did actually help mitigate the damage.



Source: MLIT

Wave gauges set 20km away from Kamaishi Port recorded a maximum tsunami height of 6.7m. Comparing cases where there are breakwaters to case were there are no breakwater using numerical calculations based on the recorded results, it became clear that, with the breakwaters, the heights of tsunami waves decreased about 40% from 13.7m to 8.1m at the observatory within Kamaishi Port, and inundation along Otogawa in the Suga district in Kamaishi Port decreased about 50% from 20.2m to 10.0m. The calculation results mostly agreed with the reserch regarding tsunami traces and inundation areas. Moreover, according to the computation, the time when the start of inundation delayed 6 minutes. It seems that those breakwaters made elevation of water surface delayed.



Source: MLIT

Four airports -- Sendai, Hanamaki, Fukushima and Ibaraki -- suffered damages. Although ceilings of terminal buildings fell down at Hanamaki and Ibaraki Airports and all the glass windows of Fukushima Airport's control tower were shattered, those three airports resumed operations on the day of the disaster.

On the other hand, Sendai airport suffered extraordinary damages due to inundation by the massive tsunami. Not only were more than 2,000 cars swept down runways, taxiways, and tarmacs, but sediments and debris were also scattered throughout the airport premises. Machineries and power-generation facilities in the control tower and terminal buildings were also inundated. About 1,400 passengers, staff, and local residents who evacuated to the airport were temporally isolated; it took about 2 days to rescue them.

Sendai Airport Access Railway, the main access to the airport, was also greatly damaged by flooded airport tunnels and inundated operation management facilities. Consequently, though the Airport resumed its operation for private airplanes on April 13, alternative bus transportation has been continuing between Mitazono and Sendai Airports.

40: Damage on Sendai Airport

Source: MLIT (left); Miyagi Prefecture (right)

The bus system is an important backbone of public transportation. Bus operators in Iwate, Miyagi, and Fukushima suffered damages; 219 vehicles were lost, damaged, or flooded, and employees and company buildings were afflicted. Consequently, many local and express buses stopped their operations. Even in April 28, about 1.5 months after the Earthquake, 26 percent of local buses in the coastal areas of Iwate and Fukushima were not operating and 19 percent stopped their operations in the coastal areas in Fukushima. Furthermore, operators outside of the affected areas had to reduce the number of operating buses due to fuel shortage immediately after the earthquake.

41: Damage on the Access Railway to Sendai Airport

Source: Miyagi Prefecture

iv) Damage on Life supporting Infrastructure

The sewage system is one of the country's essential utilities. Due to the tsunami and other aftershocks centered in the coastal areas of the Tohoku region, 48 sewage treatment facilities stopped operations and 63 facilities were damaged. With regards to 9 sewage facilities around the TEPCO Fukushima Daiichi Nuclear Power Station, it has not been possible to determine their conditions. Damages to sewage pipes extended as long as 550 kilometers across eleven prefectures[1], which was much longer than 162 kilometers of damage from the Great Hanshin-Awaji Earthquake.

42: Damage on Sewer Facilities
Left: Southern Miyagi waste water treatment plant
Right: Hove utility hole

Sources: Miyagi Prefecture (left), Fukushima Prefecture (right)

Forests in some public parks along the coast prevented debris drifting into inland areas and the high ground of some public parks became the place for emergency evacuation. Due to the tsunami, forests developed as public parks along the coast lost many trees. Accordingly, it has been necessary to discuss on how to develop forest belts for mitigating tsunami damages and how to effectively arrange evacuation sites and routes that people can use in emergencies.

[1] By TV camera survey.

Influence of the Earthquake in the Tokyo Metropolitan Area

Even though Tokyo is 300 kilometers away from the epicenter of the Great East Japan Earthquake, it experienced strong shaking of intensity 5 upper and was affected very much.

The earthquake, which occurred in the afternoon of a weekday, stopped public transportation across wide areas due to rail checking and recovery operations. Many commuters, especially in Tokyo's central districts, consequently became unable to return to their homes.

It is expected that a great number of people will not be able to go home if a big inland earthquake were ever to occur in Tokyo. If everyone were to try to go home by foot at the same time in the case of such an emergency, sidewalks and streets will be like jam-packed trains. It may become dangerous, should a group of people fall down at the same time. People should stay where they are and remain calm until they have gathered accurate information.

Therefore, during this disaster, the Government of Japan urged people not to try to go home if it was too difficult. Public facilities were opened up to accommodate people who were not able to make it home, and blankets and other necessities were distributed. Some private buildings, which were prepared for the management of people who could not go home, allowed not only their employees to stay, but also their customers.

43: Temporary Stay of Commuters Unable to Return Home

Source: Chiyoda Ward, Tokyo

However, not every office and commercial building could manage the situation well. Due to the suspension of railways, commuters and shoppers flooded the streets and areas around stations, trying to go home by foot, by bus, or by any other possible means.

Furthermore, people were trapped in at least 210 elevators in 15 prefectures, including the Tohoku region and Tokyo. They were not rescued until noon on the day after the earthquake (March 12).

Those situations shed some light on the challenges of how to prepare for earthquakes in metropolitan areas, an important issue in case of an earthquake in the Tokyo metropolitan area.

Undersupply of electricity due to the TEPCO (Tokyo Electricity Power Companies) nuclear plant accidents greatly affected economy and society in areas to which TEPCO provides electricity, including the Tokyo metropolitan area.

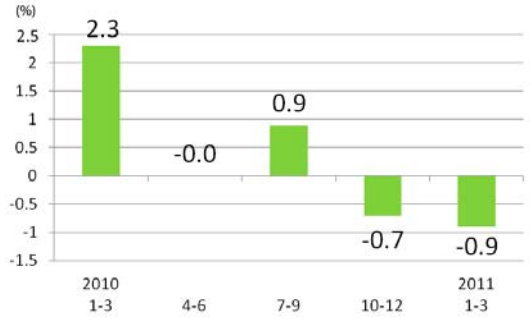
To avoid large-scale blackouts due to the undersupply of electricity, TEPCO urged residents to save electricity and started planned blackouts by district on March 14 for electricity-demand control. Because of the short notice in the beginning about the planned blackouts and because most railways suspended or reduced their operations in the Tokyo metropolitan area, many commuters were badly affected. In order to remedy the situation, railway companies, TEPCO, and the Ministry of Economy, Trade and Industry kept in close cooperation with each other to rearrange train timetables and operations of electrical substations. As a result, many lines improved in terms of schedules and operating areas.

Serious Influence on Economic Activities

Though it is hard to accurately figure out economic damages caused by the Great East Japan Earthquake, the Cabinet Office estimated that stock worth of 16.9 trillion yen including buildings, lifeline utility facilities and social infrastructures, was dameged[1]. This figure is much greater than the estimated value of 10 trillion yen for direct damages in the affected areas of the Hanshin-Awaji Earthquake.

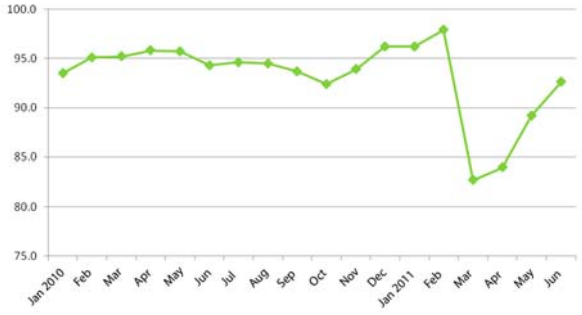
44: Changes in Economic Indexes before and after the Great East Japan Earthquake

Trend of Real GDP Growth Rate



Source: MLIT based on the "Quarterly Estimates of GDP 2011, Jan. to Mar. 2011 (the second preliminary)" of the Cabinet Office

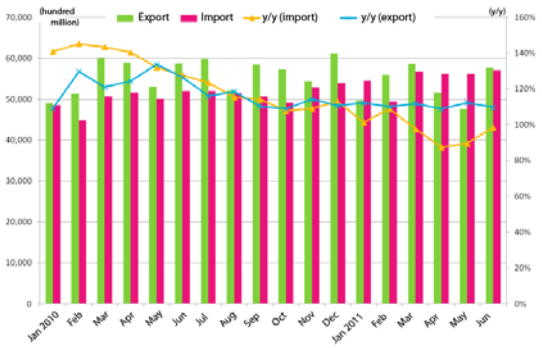
Trend of Industrial Output Index



Note: The mean value in 2005 is 100.0

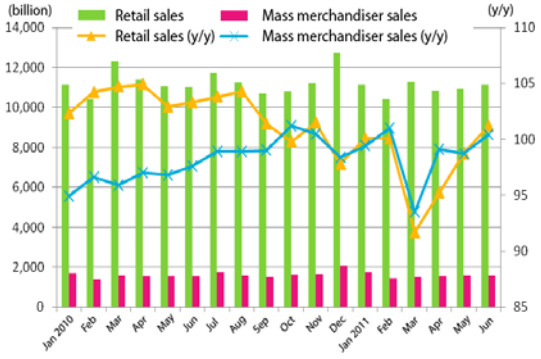
Source: MLIT based on the "Indices of Industrial Production" of the Ministry of Economy, Trade and Industry

Trend of Import/Export



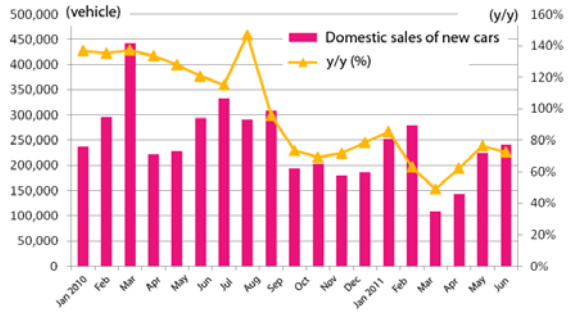
Source: MLIT based on the "Trade Statistics of Japan" of the Ministry of Finance

Trend of Retail Sales



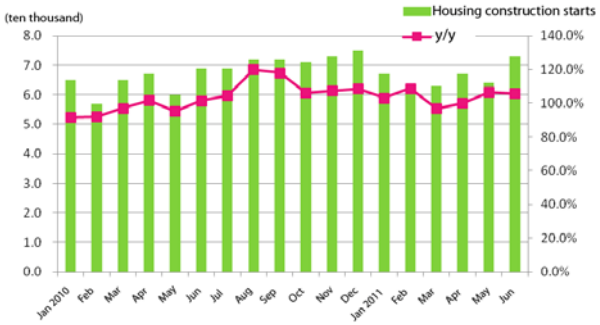
Source: MLIT based on the "Current Survey of Commerce" of the Ministry of Economy, Trade and Industry

Trend of Domestic New Car Sales



Source: MLIT based on materials of the Japan Automobile Dealers Association

Trend of Housing Construction Starts (Raw Figure)



Source: MLIT

[1] The Cabinet Office summed up the information on stock damages (*e.g.* buildings, lifeline utility faculties, social infrastructures) reported by each afflicted prefecture and national ministries, and announced the data on June 24. The estimated value might change when details of damages become clearer. Figures do not include damage or loss from the nuclear power plant accidents.

This earthquake brought not only direct damages but also indirect economic damages, such as the decline of output by corporations due to factory damages and breached supply chains. Moreover, it looms on various economic activities in both domestic and international fields, through electricity undersupply and planned blackouts due to the nuclear plant accidents. Additionally, there were agricultural and fishery damages and even reputational damage caused by the radioactive diffusion.

The earthquake caused not only direct damages to ports and airports and but also reputational damages due to the nuclear accidents. Consequently, international transportation has been severely damaged.

Eleven ports (international hub port and important ports) along the Pacific coast in the Tohoku region, which had handled seven percent of all cargos nationwide and three percent of the country's total trade amount, were essential infrastructures in supporting the livelihoods and industries of the region. Those ports were afflicted and have had difficulties in continuing to play such important roles. Furthermore, the damages on supply chains amongst corporations badly affected economic activities in areas even outside of those afflicted. Damages are not limited to infrastructure of any one region; they are widespread.

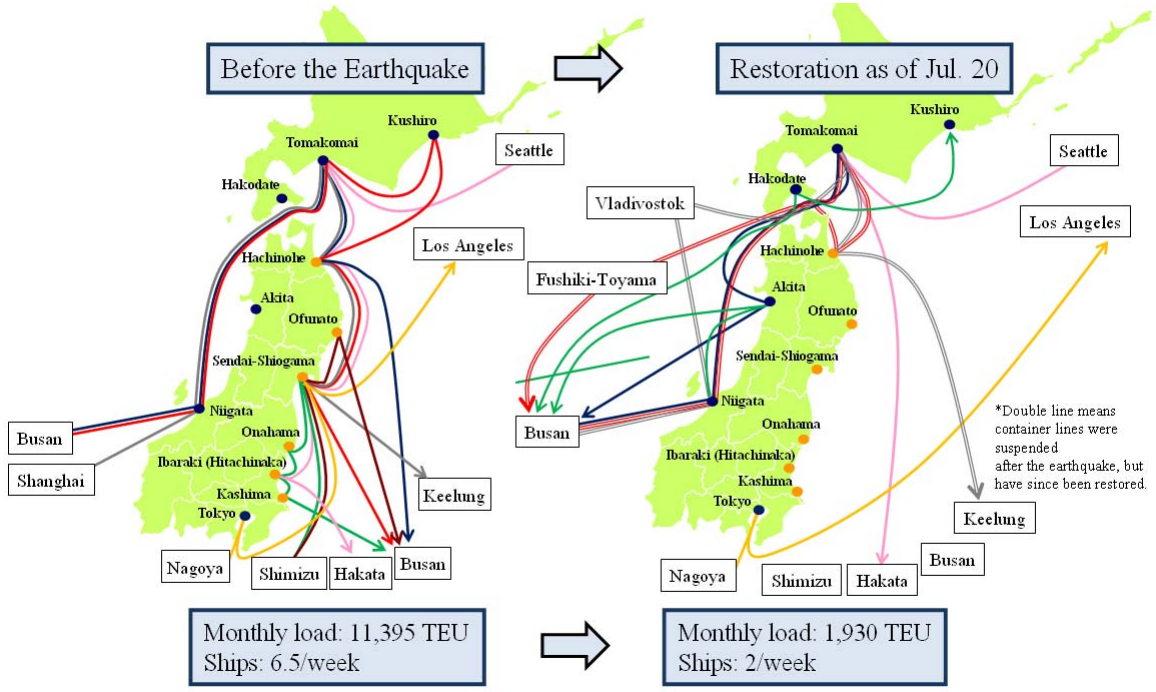
Because of these situations, operations were suspended for regular routes of international container vessels and domestic feeder routes connecting Tohoku with the Keihin port, artery routes for Tohoku and northern Kanto. Reputational damages caused some companies (mostly foreign ship lines) to stop making a port call at Keihin port. On another front, some ship lines were forced to change their routes to Korea's Busan Port via Akita and Niigata ports along the Japan Sea coast.

Consequently, the affected ports, including Keihin port (which had just been designated as a strategic port for international container transportation in August 2010) face a serious situation; international container vessels from/to East Japan areas have to now make the switch in Pusan and other ports. If the restoration of affected ports is delayed, severe damages will spread to all Japanese industries and affect the country's economy as a whole.

With regards to international airlines, some foreign airline companies tried cancelling or changing flight routes centering on Narita and Haneda routes.

Considering that Kobe port, one of the top ports worldwide before the Great Hanshin-Awaji Earthquake, lowered its international status due to the earthquake and had difficulties in its restoration[1], there is a concern regarding negative impacts on our economy of changes in international transportation of goods and passengers, which are caused by the huge earthquake and accompanied reputational damages.

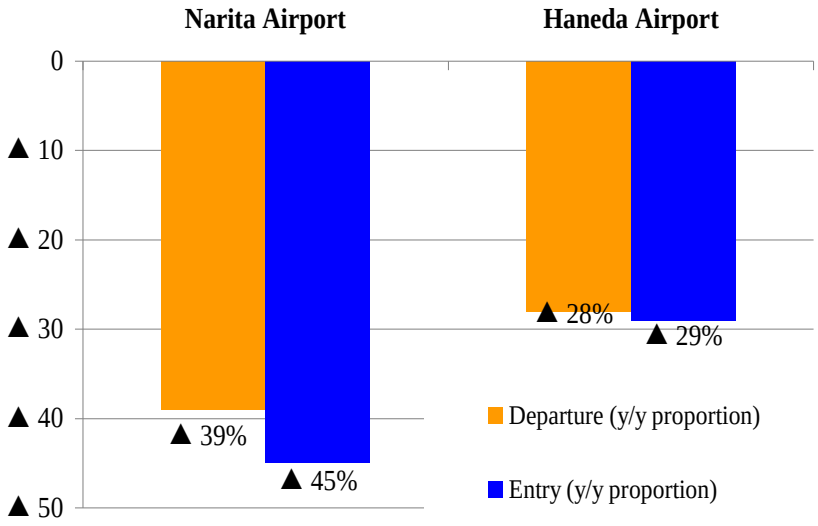
45: Regular Lines Calling at Ports in Tohoku and Northern Kanto before and after the Great East Japan Earthquake (Regular Foreign Cargo Line)



Notes: The values are the total for the affected prefectures (Aomori, Iwate, Miyagi, Fukushima, and Ibaraki).
Source: MLIT

[1] The number of containers handled in Kobe Port was sixth in the world (the first in Japan) in 1994, before the Hanshin-Awaji Earthquake; however, it went down to 23rd in 1995 and 46th in 2009.

46: Number of Entries and Departures at Narita and Haneda Airports Before and After the Great East Japan Earthquake

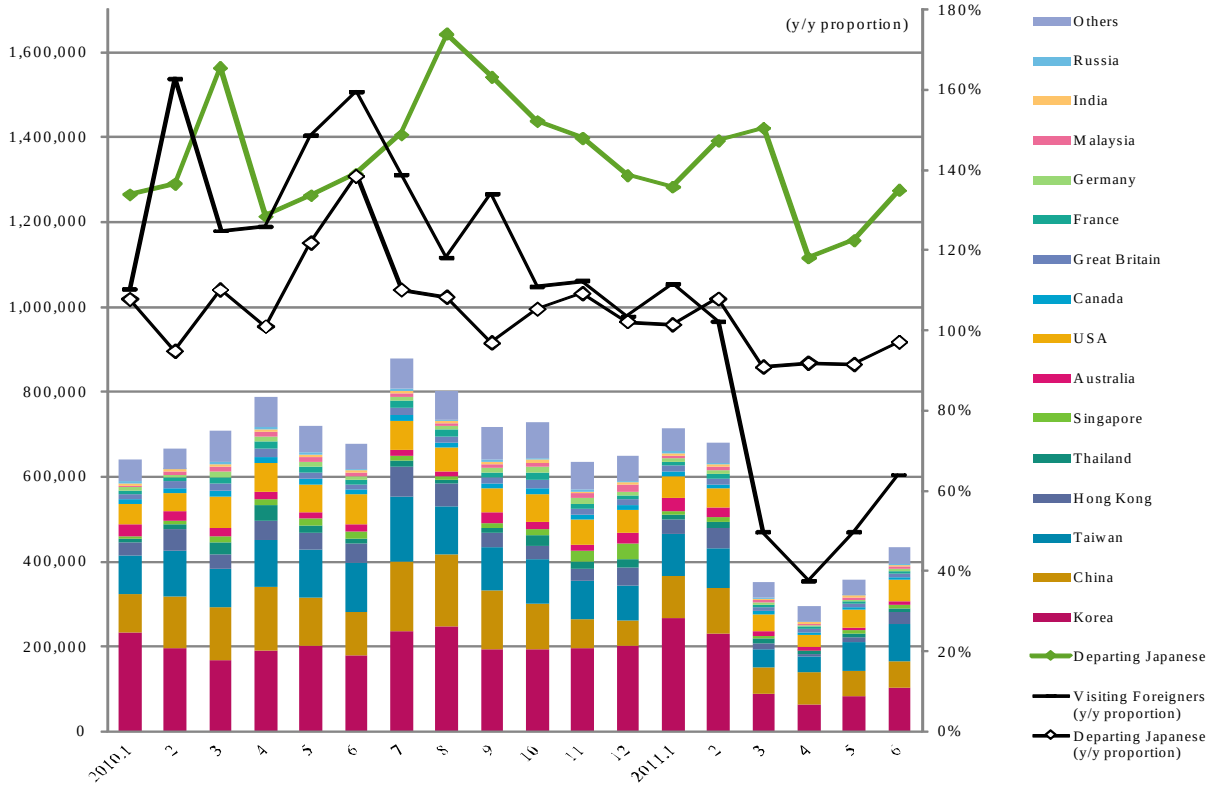


Note: Data of Narita Airport show year-to-year proportions of the number of people who entered and departed Japan between March 11th and April 18th 2011. Data for Haneda Airport is the percentage of entry/departure from March 11th to April 18th, 2011 compared to the one from March 1st to March 10th, 2011.The mean number of entry/departure per day is compared.
Source: MLIT

For tourism, there was a wave of cancellations by foreign visitors and Japanese visitors. The number of foreign visitors in March and April, 2011 decreased on a year-to-year basis by 360,000 (-50 percent) and 490,000 (-63 percent), respectively. These were the largest decreases in the past 50 years.[1]

The Japan Tourism Agency affirmed that cancellation rates of hotel bookings from March to April were 61% in Tohoku region, 48% in Kanto region, and 36% nationwide. The disaster affected the tourism industry badly through bankruptcy, the closure or suspension of affected hotels and inns.

47: Trends in Foreign Visitors and Departing Japanese Before and After the Great East Japan Earthquake



Source: MLIT from documents of JNTO

[1] The maximum decrease was 42 percent in August, 1971.

Section 2: Unified All-Out Operations of MLIT

1. Initial Response and Temporary Restoration

Establishing Unified All-Out Emergency Management Systems

In regards to approaches for earthquakes originated in and around the Japan Trench and the Kuril Trench, the Japanese government had assumed eight different types of earthquakes, including the “Meiji-Sanriku” type and the “off the coast of Miyagi” type, and had announced damage estimations. However, considering that the number of deaths was estimated at about 2,700 in a worst case scenario (Meiji-Sanriku type), the government was not expecting this vast scale of widespread damage. [1]

The outstanding and widespread damages was beyond expectation, and made the initial response (including the grasping the damage) extremely difficult.

The government set up the Emergency Task Force for the first time since the enactment of the Basic Act for Disaster Countermeasure in 1961, in which all the ministers take part with the Prime Minister as the chief.

MLIT also set up the MLIT Emergency Task Force 30 minutes after the earthquake to manage emergency response of all MLIT offices, including the Tohoku Regional Development Bureau and the Tohoku District Transport Bureau [2].

In the initial response and temporary restoration, MLIT put all efforts towards rescuing the afflicted and towards opening and maintaining emergency transportation routes via roads, airlines, and sea lines to save as many lives as possible. In trying to figure out the damaged conditions and needs of the affected areas – which were changing from moment to moment – MLIT utilized all available measures to manage diverse types of damages and pulled all-out efforts in cooperation with not only related national ministries and local governments (including the afflicted ones), but also related private business associations. [3]

MLIT dispatched its 24,779 officials until August 7 in order to support the MLIT On-Site Emergency Task Force and the affected municipalities which lost their administrative functions during this disaster. Sixty-two officials were sent as members of the Technical Emergency Control–FORCE (hereinafter called TEC-Force) on the day of disaster, and 400 were dispatched the next day. More than 500 TEC-Force officials worked together at the peak period. The total number of dispatched TEC-Force officials was 18,053, the largest number since its establishment in 2008. Also MLIT sent 19,512 machineries and equipments for managing disaster to the affected areas.

48: Dispatch of MLIT Officers to the Affected Areas

	A Total of Dispatch (as of Aug 7th)	Remarks
MLIT Officers	24,779	
Officers who took part in the TEC-FORCE	18,053	
Equipment for Disaster Management	19,512	Trucks for lighting, drain pumps, satellite relays, headquarter facilities, waiting support, water sprays, etc.

Source: MLIT

[1] The Central Disaster Management Council of Cabinet Office has been discussing how to estimate future seismic activities and resulting damages, based on understanding and analyses of this earthquake, tsunami, and the resulting damages. On June 26, the “Expert Panel Regarding Countermeasures Against Earthquake and Tsunami by Learning from the Great Tohoku Earthquake" announced the “Interim Report on Basic Concept of Countermeasures Against Coming Tsunami Disasters" and the "Suggestion from the Interim Report".

[2] The Task Force gathered every day until April 11 and 49 times until August 11.

[3] The "Special Council for Supporting Livelihood of the Afflicted" was set up in the Task Force of the Government on March 17 (renamed into "Support Team for Livelihood of the Afflicted" on May 9). Under the Council, Working Conference such as the "Council for the Restoration of the Affected Area" were set up for the concerted measures of all related national ministries towards many and various challenges.

Column - Temporary Bulletin Board for the Affected Municipalities

One of the biggest difficulties from the Great East Japan Earthquake was weakened capabilities of municipalities to offer information about the affected areas. The MLIT Tohoku Bureau managed situations in which more affected areas had less effective ways of communication. It offered disaster management vehicles to many municipalities that lost communication measures in order to secure such measures. In addition, it opened a temporary bulletin board on the MLIT homepage so that municipalities could ask for help regarding supplies until full-fledged communication means were restored. Since March 19th, 20 municipalities in Iwate, Miyagi, and Fukushima have made use of it.

Column - Technical Emergency Control Force of MLIT (TEC-FORCE)

The Technical Emergency Control Force (TEC-FORCE) was established in MLIT (including the National Institute for Land and Infrastructure Management, the Geospatial Information Authority of Japan, local bureaus of MLIT, and the Japan Meteorological Agency) in 2008 in order to offer smooth and immediate technical support for investigations of damage situations, prevention of damage enlargement, and early reconstruction, etc. when a massive natural disaster occurs or when there is a possibility of one occurring.

A total of 1,500 people for the 2008 Iwate-Miyagi Earthquake; 1,100 for the 2009 Chugoku-Shikoku Rainstorm; and 200 for the Amami Rainstorm were dispatched.

During the Great East Japan Earthquake, a total number of 18,053 (as of August 7th) people were sent to the affected areas to figure out the emergency situation immediately, secure and restore disconnected communication measures, drain pooled water by drain pump vehicles, and to investigate conditions for recovery.

Mission of TEC-FORCE

Source: MLIT

Source: MLIT

Left: Damage investigation
Center: Satellite communication vehicle dispatched to Ishinomaki City
Right: Meeting with affected municipalities and Self-Defense Forces

Unprecedented Rescue and Search

Because tsunami warnings and cautions to the areas including the Japan Sea side were announced, the Japan Coast Guard (hereinafter called JCG) dispatched all the vessels and airplanes in every district (349 patrol boats and 46 airplanes on the peak day of March 12). After those warnings were lifted, the JCG dispatched the patrol boats and planes to the Pacific coast across the Tohoku region, which suffered massive damages.

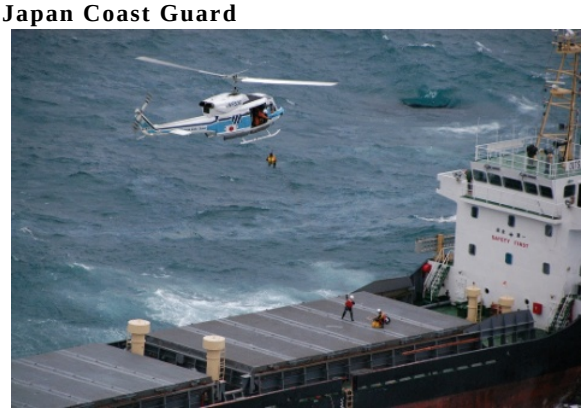
49: Activity of the Japan Coast Guard

	Maximum Dispatched	Total Number Dispatched (as of August 11)
Special Salvage Unit, etc.	35persons (March 13)	2,200 persons
Patrol Boat	349 boats (March 12)	7,044 boats
Airplane	46 planes (March 12)	2,404 planes

Source: Japan Coast Guard

The JCG rescued and searched afflicted people where a great deal of debris was diffused and floating in the sea along the coast due to the huge tsunami. JCG rescued 360 people by their patrol boats and airplanes. People were saved, included those left behind in drifting ships, those isolated or floating in inundated land areas, and those injured and sick. The JCG also investigated whether the drifting ships had survivors on board and confirmed there were no people on the all of 504 ships. Furthermore, it found 321 drifting dead bodies (up until August 11).

50: Activity of the Special Salvage Unit of the Japan Coast Guard



Source: Japan Coast Guard

Emergency Drain and Prevention of Secondary Disaster

The tsunami caused by this massive earthquake inundated a large area along the coast, and 112 million cubic centimeters of water (approximately 310,000 pools of 25 meter long) filled the area as of March 13. The flooded water greatly impeded the emergency rescue of missing people and the restoration of damaged facilities. Therefore, MLIT gathered drainage pump vehicles from all Regional Bureaus across Japan and carried out drainage of the places where natural drainage was difficult due to wide area coverage and depth of inundation. A total of 4,000 vehicles conducted drainage intensively and effectively in 66 points of 16 municipalities within Iwate, Miyagi, and Fukushima prefectures. MLIT completed the drainage operation at the end of June.

51: Drainage Activity in the Area Pooled by Tsunami

Source: MLIT

52: Situations before and after Drainage (Omagari District in Higashi-Matsushima City, Miyagi)

Before drainage (Mar. 27)

After drainage (Apr. 3)

Source: MLIT

Due to the outstanding negative impacts of the massive earthquake and tsunami on infrastructures such as coast and river levees, in addition to land subsidence and inundation across wide areas, the afflicted areas have become dangerous and prone to having secondary disasters (*e.g.* aftershocks and the accompanying tsunami, high tides, heavy rains, storm and sediment disaster).

Facing these problems, MLIT has promoted measures to prevent secondary disasters in seasons of snow melting, early summer rain, and typhoons by investigating land subsidence due to the earthquake via aerial laser measurement, evaluation of and the announcement of risks for secondary disasters, and the effective draining of the afflicted areas by drainage pump vehicles deployed nearby.

53: Reconstruction Schedule concerning the Prevention of Secondary Disasters

April May June August August September October

Flood season

Snow melting season / Rain season / Storm season / High tide season

Evaluation and announcement of secondary disaster risk (considering the fact that area safety has declined because of the Great East Japan Earthquake)

Monitoring

Evaluating and announcing risks

*Already announced are conditions of land subsidence in Sendai lowland and coastal areas of Miyagi and Iwate.

Drainage of inoculated areas

Urgent drainage

*Departments in charge of rivers, coasts, agricultural policies, and sewage cooperate to take urgent countermeasures to protect coastal lowlands and to carry out necessary operations for inland water (drainage by drain pump vehicles, etc.)

Tidal wave control

Recovery of coastal breakwaters

Emergency measures (sandbag build-up to a level of tidal wave) → **Temporary measures** (reinforcement of front side of sandbag buildup, etc.)

	3 prefectures (Iwate, Miyagi, and Fukushima)			
	All	Fully- or half-destroyed	Temporary managed location*	Implemented
Extension of coastal protection (km)	About 300	About 190	About 50	About 19

* Sections where important public facilities are protected

* Carry out as many measures as possible in the places where construction is possible.

Actual reconstruction (restoration with embankment, reconstruction of breached bank protection, etc.)

Management of rainstorms and floods

Measures for warning and evacuation

Lower standards for calling out water company and for announcement of flood forecasts for designated rivers, rainstorm warnings (inundation, etc.) and flood warnings, announcement to residents, etc.

* Adjust depending on situations

River levee/ Infrastructures for rivers (floodgates, watergates, etc.)

Temporary measures (Temporary reconstruction of ievees by embankment, etc.)

* Carry out as many measures as possible in the places where construction is possible.

	Affected location (directry controlled)	Temporary managed location*	Implemented
Tohoku	1,195	29	29
Kanto	920	24	24
Total	2,115	53	53

Actual reconstruction (restoration with embankment, reconstruction of breached bank protection, etc.)

	Affected location (directry controlled)	Actual reconstruction	
		By the end of June 2011	By the end of June 2012
Tohoku	1,195	993	202
Kanto	920	733	187
Total	2,115	1,726	389

Sediment disaster control

Measures for warning and evacuation

Investigation of details (check-up on location in risk of ediment disaster)

	All	Implemented	Review of current situations (A/B)
Checked locations	33,301	32,302	1,143

* Check-up has been completed, except in some areas where operation is not possible (traffic-blocked areas or affected areas by nuclear power plant accidents in Miyagi and

Lower standards for announcing warning information for sediment disasters, rainstorm warnings (landslides), etc.; strengthen vigilance with landslide sensors, etc.

Temporary measurement (sandbag buildup, etc.)

Development of sediment control facilities

At locations where a landslide occurred during the earthquake, start urgently constructing sand erosion protection.

	By rainy season *1	By typhoon season *2
Constructing sand erosion protection (points where operation started)	18	24

*1 Locations where landslide etc. occurred in the earthquake. (As for Disaster-related project for sediment control, it is planned to be finished around the end of FY 2011.)
*2 Locations holding danger of secondary landslide etc. (As for temporary extra budget, the operation is planed to be finished around the end of FY 2011.)

Source: MLIT

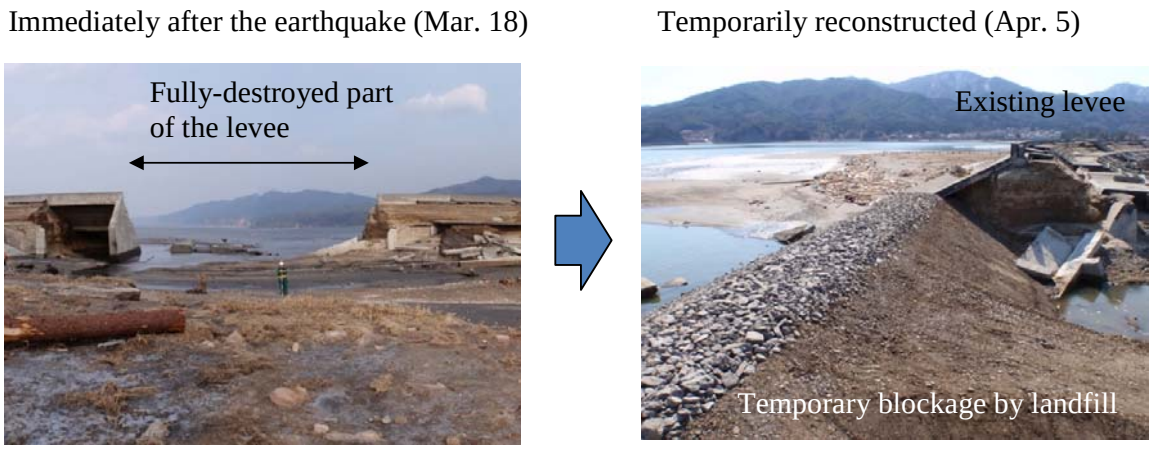
The Japan Meteorology Agency (hereinafter called JMA) has been announcing detailed meteorological information for disaster management to support livelihood and restoration activities in the afflicted areas. For instance, it has been occasionally delivering information on active aftershocks, and forecast and calling for evacuation from inundation and sediment disasters as early as possible by announcing heavy rain, flood, and sediment disaster warnings even at the point of lower risk. In addition, it has been announcing high tide cautions and sea level information for the coastal areas that experienced land subsidence. Furthermore, it established a portal website immediately after the disaster to provide various supporting information such as one sheet summaries with meteorological information about each of the affected municipalities. It also set up an English portal site to support activities of international organizations.

The JMA is planning to deliver adequate and accurate meteorological information for disaster management by restoring and reinforcing observation networks through the increase of temporary observatory points and the satellite backup of communication lines.

MLIT has promoted measures to prevent secondary disasters by high tide along around 50 kilometers of coast. To prevent inundation even in spring high tide, it has tried to recover coast levees by sandbagging until summer rainy season and strengthening the levees until typhoon season (prioritizing the levees behind which are located essential facilities for recovery or restoration of the afflicted areas).

MLIT promotes appropriate measures for full restoration, in coordination with city planning and recovery, and the restoration of industries in the affected areas.

54: Temporary Recovery of Coastal Levee (Miyako City, Iwate)



Source: MLIT

MLIT promotes necessary measures against heavy rains and flooding from rivers. Because the four river systems in Tohoku (the Kitakami, Naruse, Natori and Abukuma Rivers) and the nationally controlled rivers such as the Tone and Naka Rivers in the Kanto region have many points where they significantly lost capacity to accommodate and lead water flow due to breached levees caused by the tsunami and levee subsidence due to liquefaction, MLIT immediately launched levee recovery and restoration, and tried to secure the same height and width as before by summer rainy season. At 53 points where levees were especially damaged, MLIT operated urgent reconstruction works. Furthermore, it strengthened warning and evacuation preparation by lowering the water level requirement for evacuation during rainy seasons.

Planned are full restoration of river levees including measures responding to land subsidence (securing the same levee height as before), countermeasures against liquefaction such as sheet piling, increased heights of levees (planned levee height), and automation and remote control of water gates. [1]

As for suspension of sewage pump facilities for rain water drainage, which plays a role in urban drainage, MLIT promotes emergency response by temporarily restoring them using makeshift power sources or temporary pumps.

[1] MLIT launched full restoration after typhoon season and completed it as soon as possible in 389 locations where full restoration had not been completed by August 8, 2011. (All locations are planned to be completed by the end of June 2012.)

55: Recovery of River Levee

Source: MLIT

To prevent or mitigate sediment disasters during snow-melting or rainy seasons, MLIT carried out urgent checkups of locations with risk of sediment disaster, and promoted temporary recovery and continuous monitoring of those risky places in the municipalities that experienced more than 5 upper of seismic intensity.[1] MLIT also launched urgent development of sediment control levees in the areas affected by the earthquake and has promoted the development of levees in the places where landslides might happen until typhoon season. Furthermore, meteorological observatories and prefectural governments have worked together on early evacuations by lowering the risk level at which sediment disaster warnings are to be announced.

Based on the result of these urgent checkups, for the areas where sediment disaster is highly likely to happen during rain, MLIT will consider systematic measures against sediment disaster in terms of both physical infrastructures (hard policies) and intangible measures (soft policies), in cooperation with prefectural governments. It also promotes measures against sediment disaster in the affected areas, in accordance to the initiatives to rebuild afflicted cities.

Emergency Response and Recovery of Transportation Infrastructure and the Securing of Emergency Routes for Transportation and Logistics

Once traffic infrastructure is cut off, immediate response to disaster (including rescue efforts) is greatly impeded. Accordingly, temporary restoration of transportation infrastructure leading to the afflicted area was the first priority. MLIT made all the efforts to secure emergency routes for transportation and logistics on land, by sea, and by air as soon as possible in order to connect the isolated affected areas extending along the Pacific coast damaged by the huge tsunami.

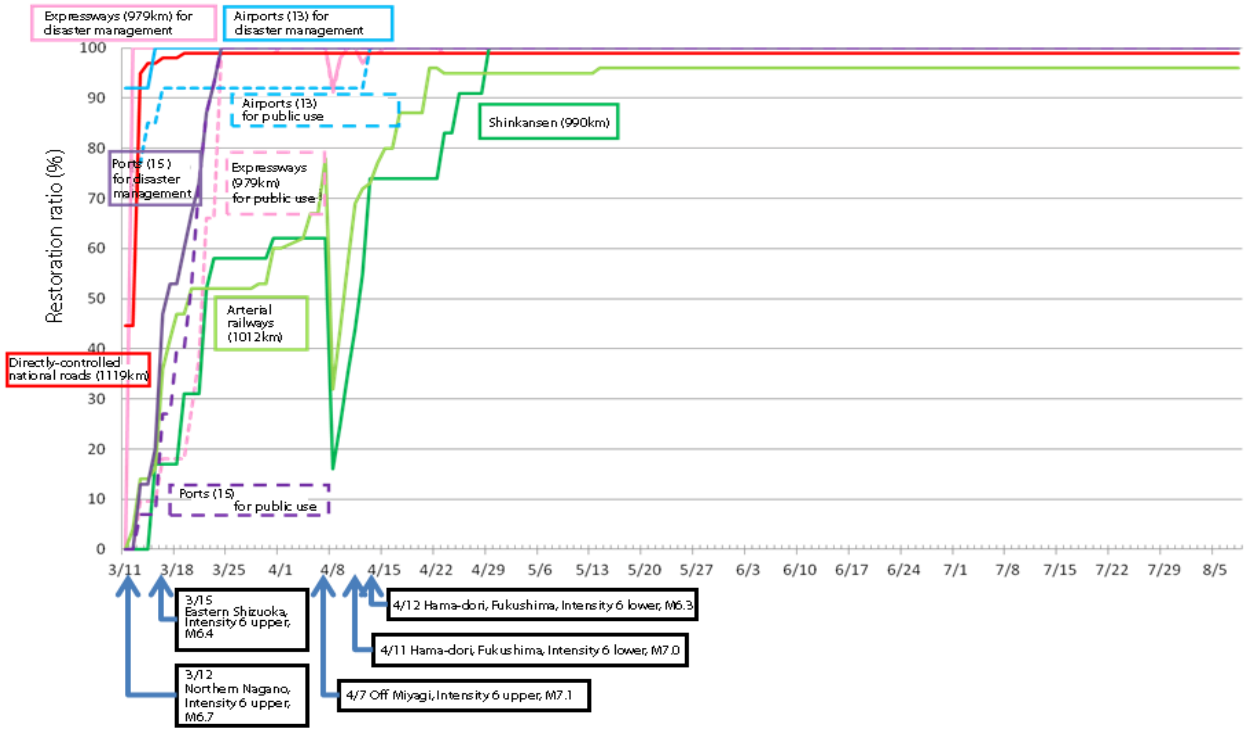
Quakeproof measures which had been taken prior to the earthquake prevented serious damages and led to early recovery of transportation infrastructures. For instance, bridge footings on highways had been made quakeproof and the Shinkansen railways had recently been equipped with automatic stopping systems that detect quakes early. These measures had been taken based on lessons from the Hanshin-Awaji Earthquake with the damage to elevated bridges due to footing collapse on the Hanshin Expressway and the damage to more than 700 bridge footings of Shinkansen railways, and on lessons from the Mid-Niigata Earthquake with the derailment of operating Shinkansen trains. Thanks to these measures, elevated bridges on expressways and the Shinkansen railways were not seriously damaged, allowing for early recovery of those infrastructures.

Sendai Airport was immune to liquefaction, and kept the flatness and pavement strength of its runways thanks to quake resistance, which in turn led to early recovery.

On the other hand, transportation infrastructures such as residential roads and local railways, the lifelines supporting local transportation and preventing settlement isolation, have been suffering extreme difficulties in reconstruction works because they were greatly damaged, especially by the huge tsunami. This disaster, having been beyond expectation, has caused serious negative influences on reconstruction works. For example, Sendai Airport had not promoted measures against such a huge tsunami, such as how to manage drifted debris and inundated emergency power generation facilities. Also, in ports around the afflicted areas, destruction of their facilities by outstanding pressures from the massive tsunami, and impeding drifting objects such as immense amount of debris, vessels sunk within ports, and fishing nets, have serious impact on recovery.

[1] Out of 33,301 points, 32,302 (about 97 percent) have been checked (checking was completed with the exception of points where checking was not possible due to traffic blocking and the nuclear power plant accidents). Among those points, 66 were classified as category A (locations of severe land deformation where emergency construction is needed) as of August 11.

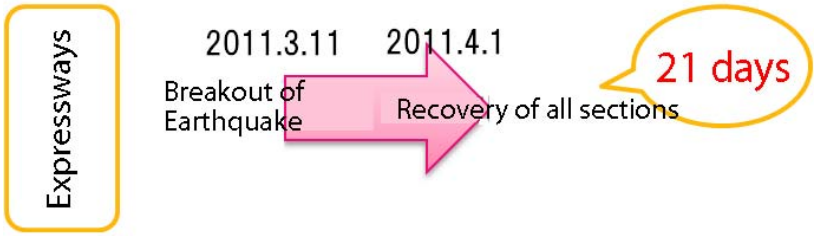
56: Recovery of Transportation Infrastructures



* 4/23 Renewed total distance of existing Shinkansen lines (1012km). Because excluded section was changed from "controlled" to "caution" and "evacuation" area for the nuclear power plant accidents.
* 4/23 Renewed total distance of existing expressways (979km). Because excluded section was changed from "controlled" to "caution" area for the nuclear power plant accidents.
*4/23 Renewed total distance of directly-controlled national roads (1119km). Because excluded section was changed from "controlled" to "caution" area for the nuclear power plant accidents.

Source: MLIT

57: Early Recovery of Expressways and the Shinkansen



*Excluded controlled sections due to nuclear power station accidents

*Emergency vehicles could drive the next day on the Tohoku Expressway (Urawa IC to Ikarigaseki IC), Joban Expressway (Sango JCT to Iwaki Chuo IC), etc.

*Reference: In the Great Hanshin-Awaji Earthquake, it took 622 days for the full recovery of expressways due to the partial collapse of the Kobe line of the Hanshin Expressway passing near the epicenter.

* Reference: In the Great Hanshin-Awaji Earthquake, it took 81 days for the full recovery of Shinkansen operations because of the collapse of and damage to over 700 bridges.

Source: MLIT.

i) Roads

Securing road access to the affected areas was urgently needed in order to ensure emergency routes for transportation and logistics as soon as possible. In order to strategically promote early restoration of road and highway networks, MLIT developed the "Comb Teeth" operation to get access to Sanriku coastal areas where the tsunami-damaged towns were scattered. MLIT secured vertical lines, the Tohoku Expressway, and National Route 45 the day after the earthquake, and 15 horizontal routes to coastal areas including Sanriku on March 15. The development then progressed to temporary restoration of National Routes 6 and 45 in the coastal area. Consequently, 97 percent of roads were reopened by March 18, a week after the earthquake.

On April 10, a month after the earthquake, MLIT completed emergency restoration of most of National Roads 6 and 45 (the exception was the off-limit section due to the TEPCO Fukushima Daiichi nuclear power plant accident), and resolved a wide area of bypass except for two sections where long bridges were damaged. MLIT even completed emergency restoration of National Road 6 within the nuclear accident off-limit area by May 8.

MLIT also carried out damage investigation and offered advice on restoration of local roads, including municipality roads, at the request of local governments.

58: Operation "Comb" for Road Openings

■"Comb-shaped route" was planned on Mar. 11 to go into the coastal areas where massive damage by a tsunami was expected.

Step 1: Secured vertical lines on Tohokudo and Route 4.

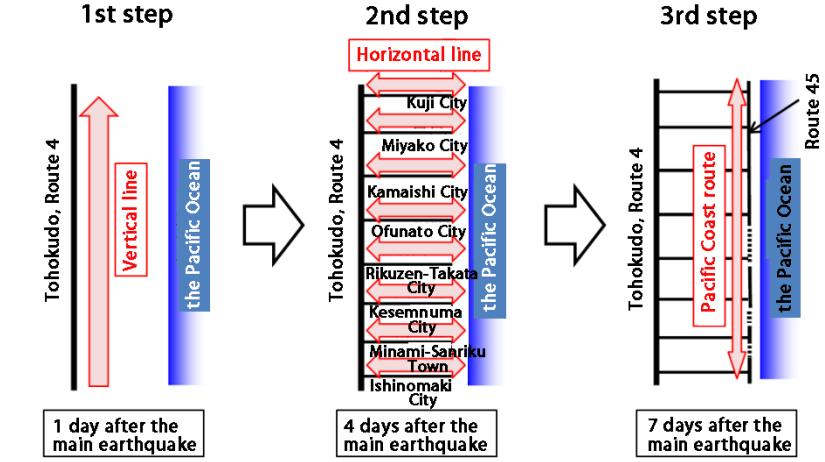
Step 2: Secured horizontal lines leading from Tohokudo and Route 4 to the Pacific Coast areas.

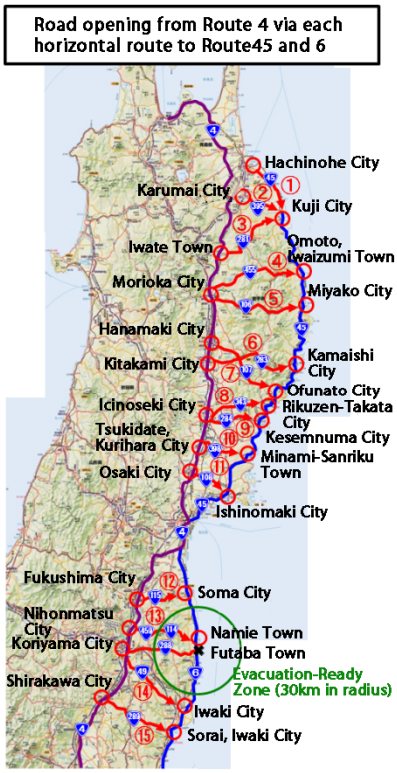
-> 3/12 Secured 11 east-west routes.

-> 3/14 Secured 14 routes.

-> 3/15 Secured 15 routes. (3/16 All vehicles could pass.)

Step 3: -> 3/18 97% completed on Route 45 and 6 along the Pacific Coast.





Source: MLIT

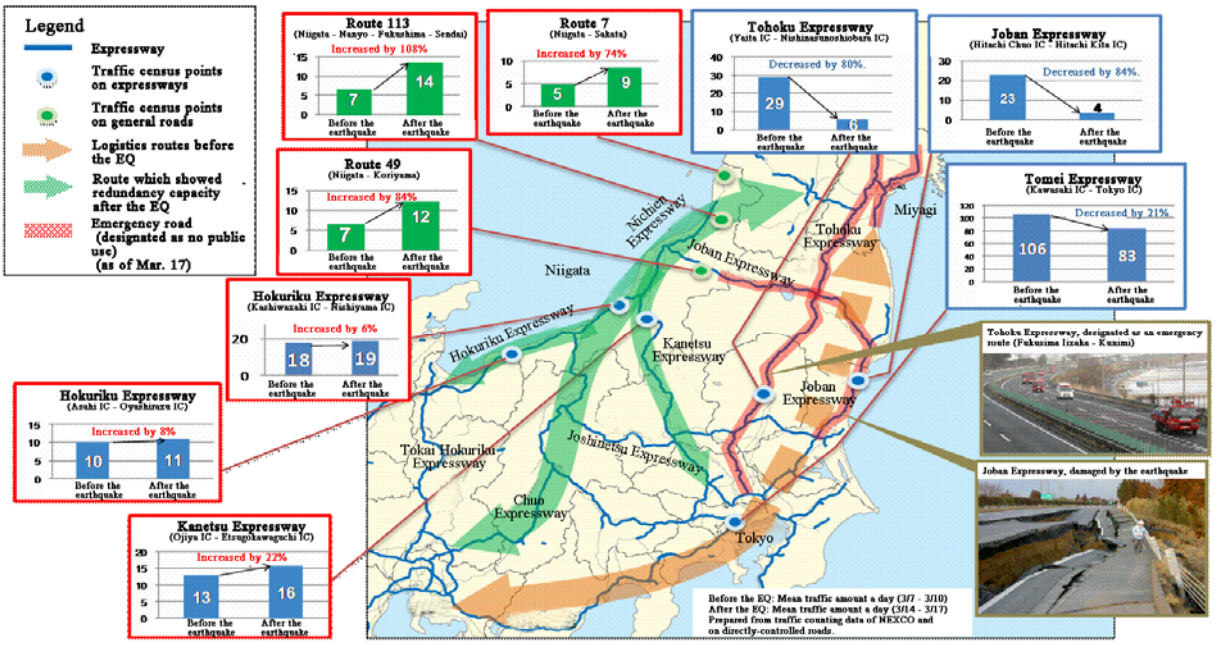
59: Temporary Reconstruction of Roads (Route 45, Nijyuichihama in Kesennuma City, Miyagi)

Immediately after the earthquake | Construction started on Mar. 26 | Road reopened on Apr. 4

Source: MLIT

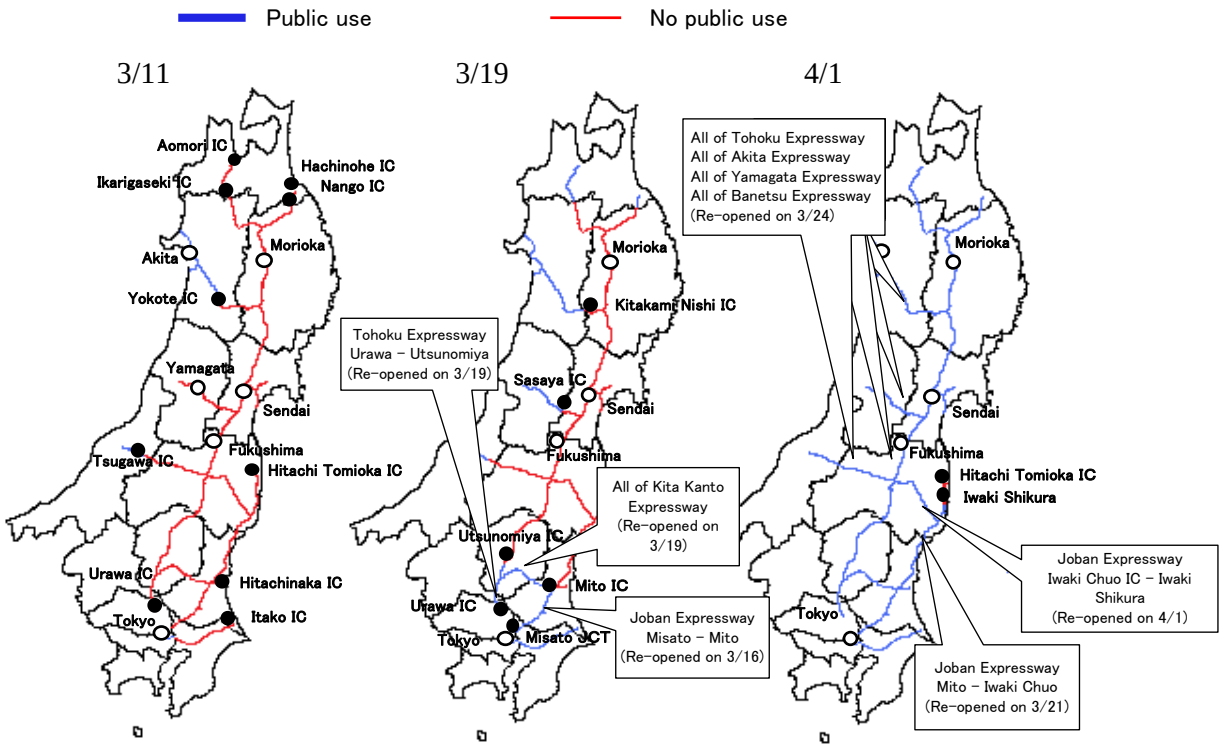
Changes to road traffic in eastern Japan before and after the earthquake show that while the Tohoku Expressway and the Joban Expressway on the Pacific coast side decreased their traffic by 80 percent after the earthquake due to the limited road network functions between the Tohoku and Kanto regions, the Hokuriku Expressway, Kanetsu Expressway, and national roads on the side of the Japan Sea increased their traffic volumes. The result means that routes on the Japan Sea side played an alternative role for those on the Pacific side.

60: Road Traffic Before and After the Great East Japan Earthquake



Source: MLIT

61: Expressway Recovery



Note: “Public Use” means the sections of expressways on which all vehicles, including small cars, can drive. It includes the case when only either direction can be passed.

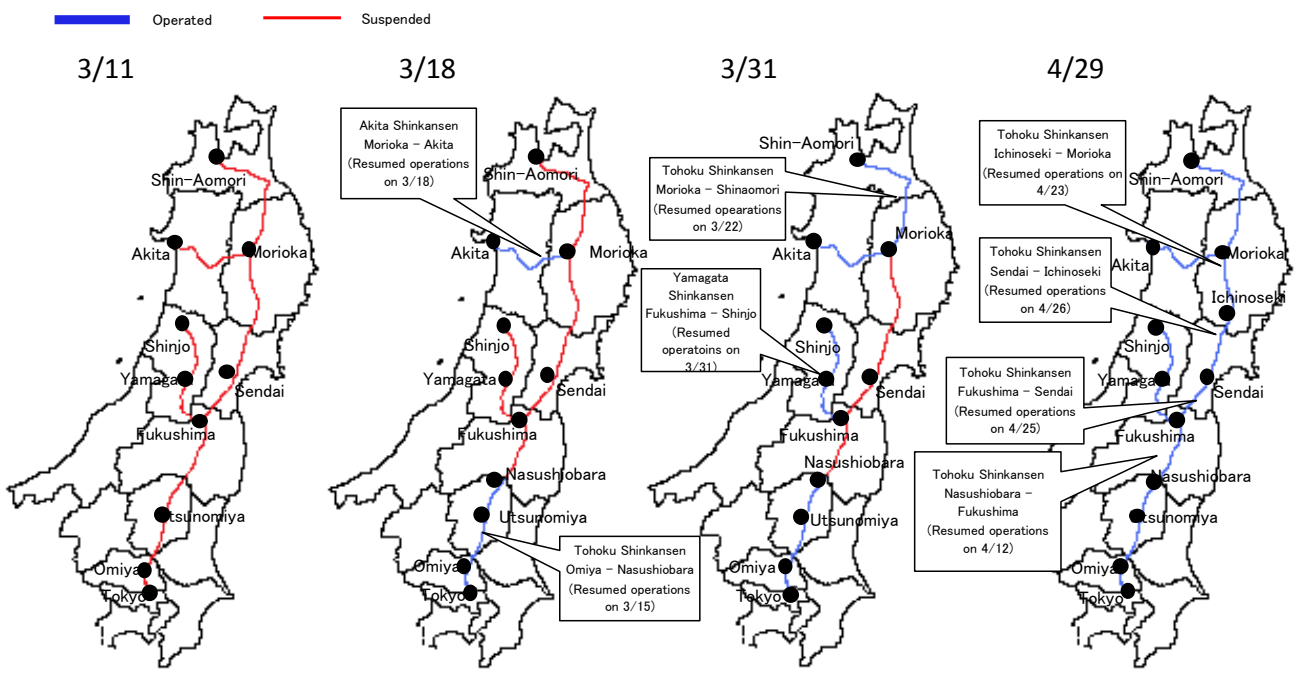
Source: MLIT

To support the afflicted and the general recovery and restoration, the expressways were opened free of charge started June 20 for the afflicted and evacuees, and trucks and buses (larger than medium size) departing from and arriving at the Tohoku region (including the Mito area of the Joban Expressway).

ii) Railways

Shinkansen lines had been reconstructed since the earthquake on March 11; full operation resumed for the Akita Shinkansen (Morioka–Akita) on March 18 and for the Yamagata Shinkansen (Fukushima–Shinjo) on March 31. The operation between Tokyo and Nasu-Shiobara on the Tohoku Shinkansen was also resumed on March 15. Though the aftershock on April 7 caused suspension of every Shinkansen line, all lines had resumed their full operations by April 29.

62: Recovery of the Shinkansen



Source: MLIT

As for local railways, the Tohoku line fully resumed its operation by April 21 and the Joban line was restarted by May 14 (with the exception of the section between Hisanohama and Watari, which is within the caution zone of the TEPCO Fukushima Daiichi Nuclear Power Station).

However, many sections of the East Japan Railway and the Sanriku Railway running along the coast have not been able to resume operations yet. Discussion and consultation have been conducted for restoration, in coordination with city planning of the damaged areas.

Column - Struggles of an Affected Local Railway

The Sanriku Railway runs from South to North in the Sanriku coastal area where the massive tsunami surged, and it suffered huge damages from the flooding of station buildings, bridges, and rails. Although there were no casualties amongst Sanriku Railway employees, some of them lost family members or houses.

Even during such a difficult situation, they sincerely sympathized with residents who lost homes and vehicles. Their enthusiasm to help those local people who had been supporting the company drove them to reconstruction work without sleep or rest in order to operate trains from wherever possible.

Fortunately, there was little damage to tunnels, which make up more than 60% of all the lines. So they started train operations between Kuji and Rikuchunoda on March 16, 5 days after the main shock; between Miyako and Taro on the 20th; and between Taro and Omoto on the 29th for free as "reconstruction support trains" during March. Immediately after resuming operations, they secured safety by slowing down and so on. Those trains became important means of transportation for not only the local residents, but also for people heading for shelters in the area. Even after April, the company kept train operations between Kuji and Rikuchunoda, and between Miyako and Omoto on temporal time schedules on which fares were free for affected locals and discounted for other passengers. Sanriku Railway greatly supports the lives of residents.

【Damage on Sanriku Railway】

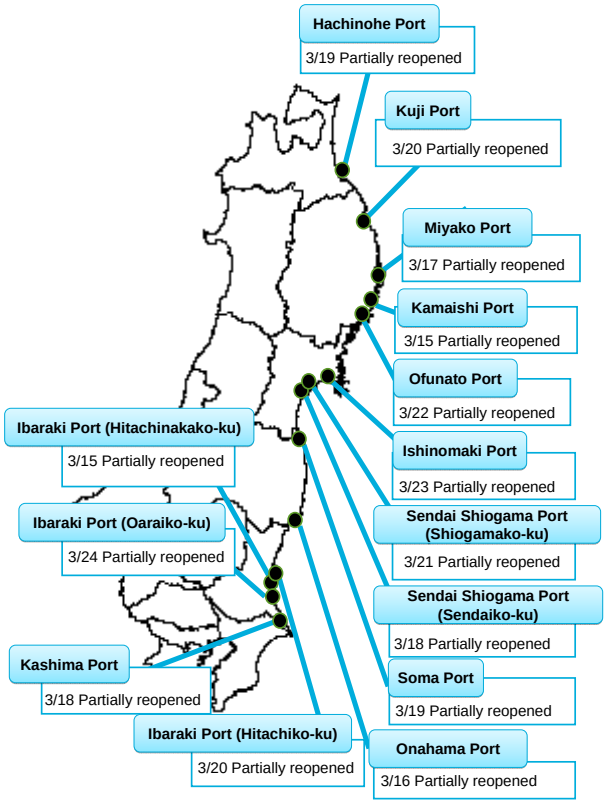
Provided by Sanriku Railway

iii) Ports

In order to deliver emergency supplies (including fuel) via sea routes, MLIT worked to re-open shipways and anchorages, and to recover port piers. As a result, some sections of piers became available at the Kamaishi Port and the Ibaraki Port (Hitachinaka Port) on March 15 and in all afflicted ports (an international hub port and other important ports) by March 24. The number of provisionally available piers at the afflicted ports (public piers with depths of more than 4.5m) that were restored was 199 (53% out of the total number[1]) as of August 11. The number of ship arrivals in the afflicted ports has been steadily increasing.

MLIT had also secured cargo handling operation systems of port transporters at every international hub port and at important ports by March 23.

63: Recovery of Ports

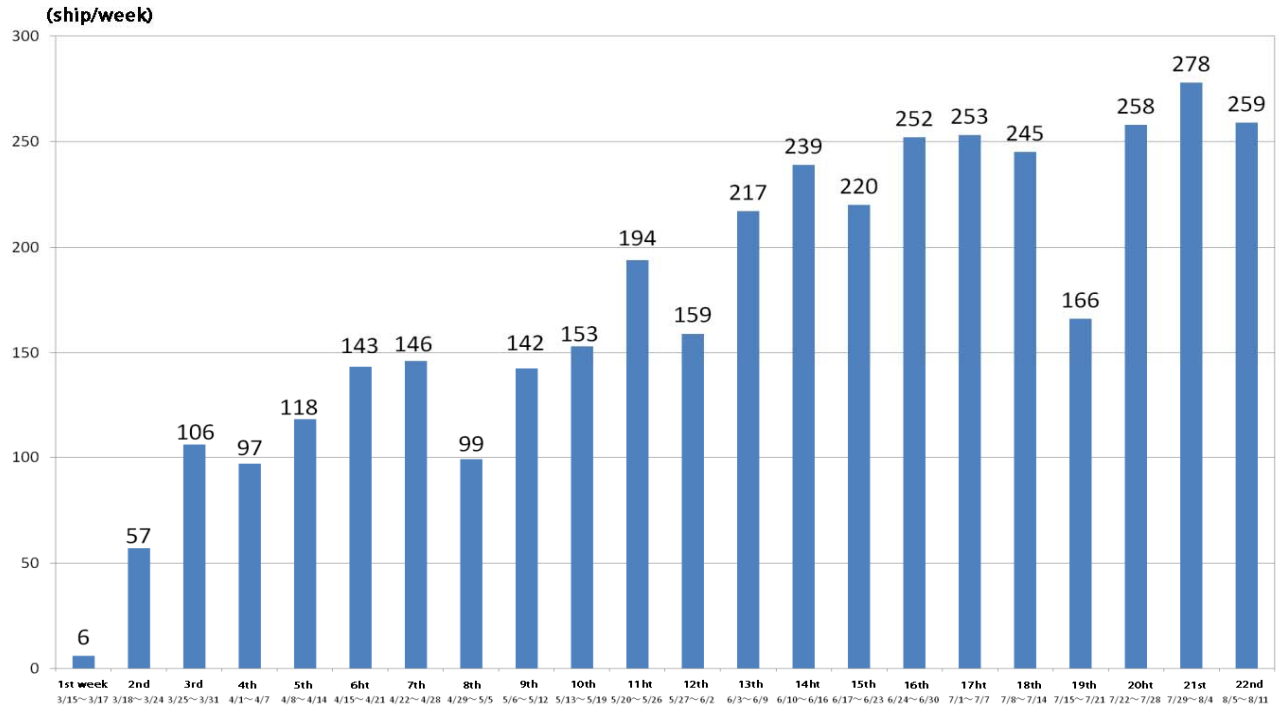


Note: An international hub port and important ports (11 ports) are marked.

Source: MLIT

[1] The number of provisionally available piers at 18 ports that have public piers of 4.5m water depth, out of international hub ports, important ports, and local ports from Hachinohe City (Aomori prefecture) to Ibaraki prefecture. Most of the facilities need restoration construction. In some facilities, draft depth and load amount are limited.

.64: The Number of Ship Entrances in Affected Ports After the Great East Japan Earthquake



Note: Total of 11 ports (an international hub port and 10 important ports) were damaged. The number of ships was tallied weekly after the earthquake.

Source: MLIT

The Japan Coast Guard towed and rescued (as of August 11) 85 drifting ships inside ports which were impeding emergency supply transportation, and it also requested private salvage boats to collect drifting debris. In order to support ships' safe entry into ports, it conducted vigilance activities by patrol ships, restoration works such as the installment of temporary lights on damaged beacons, and hydrographic research by survey vessels. Furthermore, it has progressed temporary restoration by setting up large light buoys near fallen or tilted beacon equipment on breakwaters. In a step towards full restoration of disaster resilient navigation signs, it plans to promote as much as possible the shifting of beacons' power sources to solar batteries and of light sources to LED (Light Emitting Diode).

iv) Airports

Yamagata, Hanamaki, and Fukushima Airports restarted operation on the day of the disaster to secure air lines. Twenty-four-hour operations were resumed in Yamagata Airport on March 12 and in Hanamaki and Fukushima Airports on March 13 to respond to the increase of rescue airplanes. Also, in order to promote smooth rescue activities, application procedures needed for a drop of emergency supply from an airplane were allowed more flexibility. Meanwhile, airplanes other than rescue aircrafts were strictly requested to stop flights at the altitude of less than 1,500ft.

Although Sendai Airport suffered great inundation damage caused by the huge tsunami, it escaped serious damages because of the countermeasures which had been conducted for preventing liquefaction on runways and other facilities. Early restoration works were therefore progressed to secure runways for rescue aircrafts. Water drainage operation was carried out by TEC-FORCE on nearby roads accessing the airport. On March 15, helicopters for rescue and emergency supply started using the airport. The next day (March 16) a runway of 1,500 meters long was reopened for rescue airplanes including those of the Self-Defense Force. Runways of 3,000 meter long have been in use (even at night) since March 29. While the use of damaged terminal buildings was limited, private airline services resumed their operations, leading to air connection to Haneda in Tokyo and other places including Osaka, via extra relief services.

It is necessary to promptly discuss emergency approaches such as countermeasures against the inundation of airport facilities and the installment of portable power generation units, in order to promote early recovery.

The badly damaged Sendai Airport Access Line resumed operation between Natori and Mitazono on July 23.

Reconstruction of the line is planned and will progress towards the re-opening of all sections of the line to Sendai Airport station by the end of September.

65: Reconstruction Process of Sendai Airport

March 12

March 27

Source: MLIT

2. Support for the Livelihood of the Afflicted

Transportation of Supplies via Joint Efforts of the Public and Private Sectors

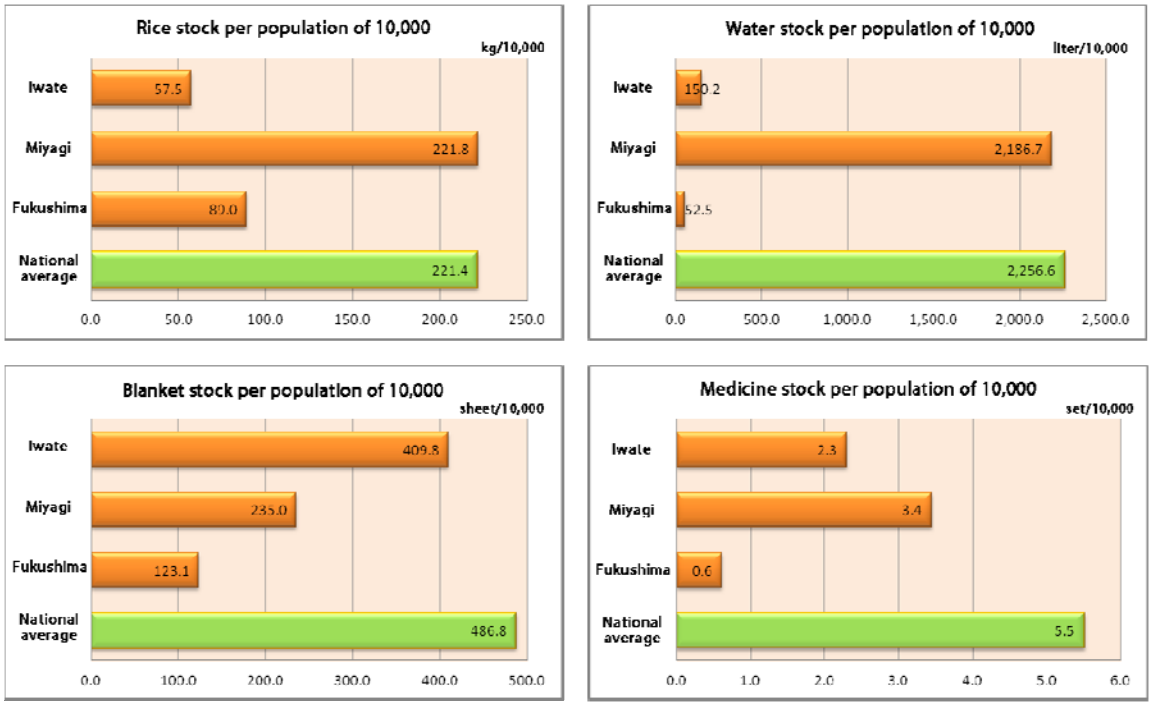
A great number of the afflicted and of evacuees across widespread area did not have sufficient supplies of goods including food, water, and blankets.

The Disaster Management Basic Plan of the Japanese Government prescribes that local governments should make efforts to store supplies, such as food, water, emergency power sources, medicines, cookware, and blankets, which are necessary for the livelihoods of evacuated residents, in or around designated shelters. The plan also asks local governments to estimate damages in case of a large scale earthquake, arrange systems to store and procure necessary supplies (including food), and draw out plans for providing such supplies. Furthermore, the plan encourages local residents to store food and water needed for survival for a few days.

However, the storage of local governments was not sufficient enough, in part due to severe financial restraints.

In addition, fuel shortage brought about secondary damages in the affected areas. Fuel had not been stored in every prefecture, which shed a light on the issue of how to procure and transport fuel with an expectation that a similar disaster may happen again in the future.

66: Supply Stock in the Three Affected Prefectures: Iwate, Miyagi, and Fukushima



Note: Each value shows total stock of the prefecture and the municipalities within (as of April 1, 2010).
Source: MLIT based on materials of the Fire and Disaster Management Agency and the "2010 Population Census" of the Ministry of Internal Affairs and Communications

During these circumstances, the public and private sectors fully cooperated to deliver supplies via land, seaways, and airways for the support of the livelihoods of the afflicted who suffered from lack of supplies.

MLIT asked the Japan Trucking Association for cooperation on transporting emergency supplies, at the request of the Emergency Task Force of the Japanese Government. In response, truck business operators delivered to the afflicted areas emergency supplies, including food such as bread and rice, blankets, and disposal heating packs. Through this operation, about 18.98 million meals, 4.6 million water bottles, and 460,000 blankets were transported to a total of 2,032 locations.

67: Cargo Shipment by Trucks

Source: Tokyo Trucking Association

Although operations of railway transportation were greatly disrupted, as seen in the suspension of the Tohoku Line, train operations were eventually resumed in line with rail restoration. At the same time, container trains operated along Japan Sea coast to avoid the suspended section of the Tohoku Line, and trucks were alternatively used for transportation. Container train operation was subsequently resumed in all sections of the Tohoku Line on April 21.

To respond to the undersupply of fuel in the affected areas, fuel was transported by tankers to ports on the Japan Sea coast immediately after the earthquake. As part of restoration efforts, tankers could set to call in the ports along the Pacific coast, starting with the Sendai-Shiogama Port on March 21.

In addition, oil transportation trains operated two routes, from Yokohama (Negishi station) to Morioka and to Koriyama along the Japan Sea side via roundabout railways to complement the suspension of the Tohoku Line.

Column - Oil Train Overcame Difficulties

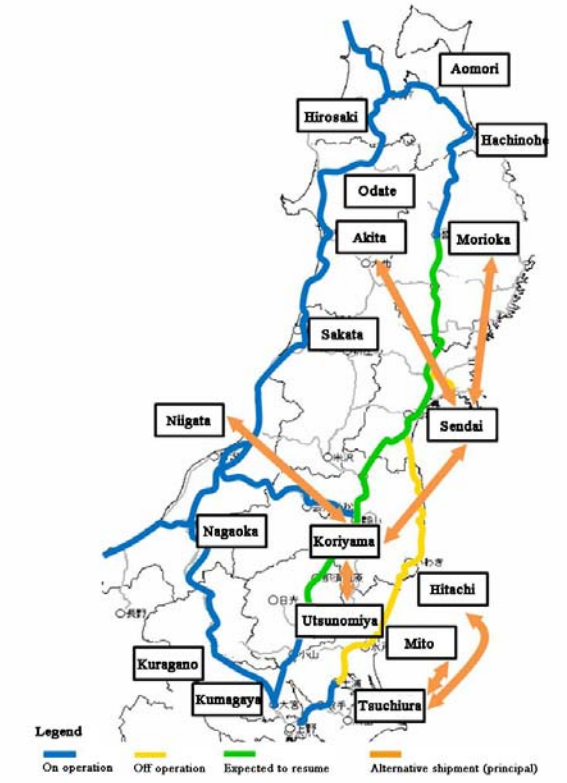
Due to the Great East Japan Earthquake, two-thirds of oil factories around the Tohoku and Kanto areas were urged to suspend their operations. Shipment of oil became difficult due to a damaged transportation infrastructure, which led to significant oil shortages in the affected areas. People could not be provided sufficient heating at cold shelters, and it was an urgent issue to supply fuels there. However, the Tohoku Line that usually provides oil to the Tohoku area was severely damaged and difficult to use.

Facing such conditions, JR Freight contributed by supplying fuel to locals who were affected, but it had various impediments. They decided to carry out shipment by a route on the side of the Japan Sea on March 14, 3 days after the earthquake. However, a shipment of such a long distance had not ever been implemented. In order to accomplish the plan, the company not only adjusted issues about tolerance of rails and bridges and time tables with JR East, but also overcame various problems such as crews, arrangement of tank trains, etc. Finally, on March 18, the first oil train started in Yokohama (Negishi Sta.) and traveled to Morioka.

On March 25, they started operations of oil trains from Yokohama (Negishi Sta.) to Koriyama via Niigata using the restored Banetu Nishi Line, a route which has a sharp slope that requires towing by DD51 diesel locomotive engines. Locomotives of the same type were gathered from all over Japan, and the project was finally operated.

Since then, 1,200 to 1,400kl a day (total: 36,849kl) on the Yokohama-Morioka route and 1,200kl a day (total 19,892kl) on the Yokohama-Koriyama have been transported. The total amount transported on both lines has been 56.741kl (equivalent to 2,850 tank trucks of 20kl).

Cargo Train Operation until recovery of Tohoku Line(as of Apr.14)



DD51 diesel locomotiv

Source: MLIT

In addition, support for the affected and evacuees, such as supply transportation, was implemented by various routes and means.

MLIT conducted supply transportation of emergency food, drinking water, fuel, etc. for the affected by large dredger and oil-collecting vessels[1] deployed by each regional bureau. The JCG not only transported and supplied aid to evacuees by patrol boats and airplanes, but also offered bathing services for the affected.

The Navigation Training Establishment utilized its training vessels to support the affected. Ginga-maru offered medicine, light oil, cooked meals, and bathing facilities at Miyako Port from March 20 to 22. Kaio-maru provided cooked meals, bathing facilities, and accommodations at Onahama Port from March 21 to 27.

Also, maritime transport companies not only offered their ferries for transportation of personnel of the SDF, police forces, fire departments, and their vehicles, but also cooperated to carry support aids and fuel, etc. towards the affected areas. In addition, cruise ships were dispatched to the afflicted areas to provide meals and bathing facilities.

68: Cargo Shipment by Ship,and Support for Affected People
Left: Unloading of assistance supplies from "Kaisho-maru"
Center: A Japan Coast Guard helicopter distributing assistance supplies in a school field
Right: Ofunato Marine Youth welcoming a cruise ship with flag signaling


Sources: MLIT (left); JCG (center); MLIT (right)

Securing Various Means of transportation in the Affected Areas

Since train networks were cut off, express buses played an important role to help people's transportation.

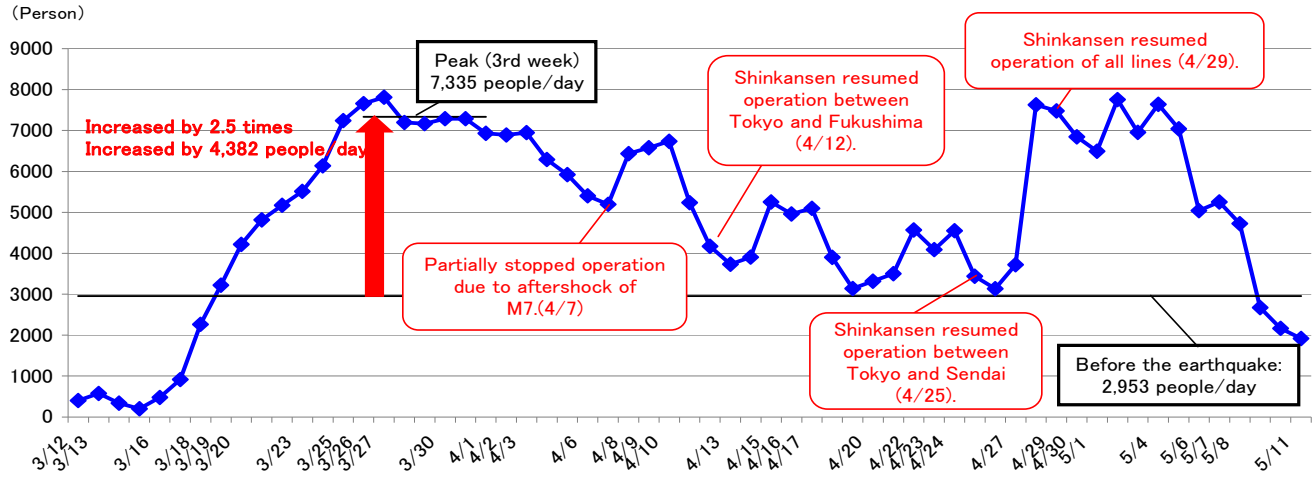
The operational routes departing from and arriving at the Tohoku region have eventually been resumed since March 12. Approximately 11,200 vehicles in total were utilized to transport about 300,000 people in 31 routes between the capital region and the Tohoku region for 2 months after the shock.

As for express bus routes connecting Tokyo and Tohoku, some routes have been newly created, and the number of what is called "series buses" (operated with multiple vehicles) have been increased in order to handle as much passenger demand as possible. A transport capability was increased to 267%, more than what it was prior to the shock. Capacity between Tokyo and Sendai was increased to 415%, and to 467% between Tokyo and Morioka.

As for other travel routes between Tokyo and Tohoku, routes were operated between Yamagata and Sendai via Yamagata Airport; between Niigata and Sendai via the Joetsu Shinkansen; and between Nasu-Shiobara and Koriyama via the Tohoku Shinkansen. Various routes combining different transportation means were also secured.

[1] Dispatched to the affected areas were "Hakusan" of the Hokuriku Regional Bureau; "Seiryu-maru" of the Chubu Regional Bureau; "Kaisho-maru" of the Kyushu Regional Bureau; and the "float for disaster management in large area" of the Hokkaido Development Bureau.

69: Express Bus Between the Tohoku and Capital Regions (31 Lines)



Source: MLIT

Column – Free provision of Buses and Taxis to Affected Areas

Due to the tsunami caused by the Great East Japan Earthquake, many buses and taxis were flooded or damaged in the affected areas. Responding to the Nihon Bus Association and the Japan Federation of Hire-Taxi Association asking help for the affected regions, bus and taxi companies cooperated over the boundaries amongst grouping companies to lend 76 buses and 132 taxis to secure transportation in the affected area.

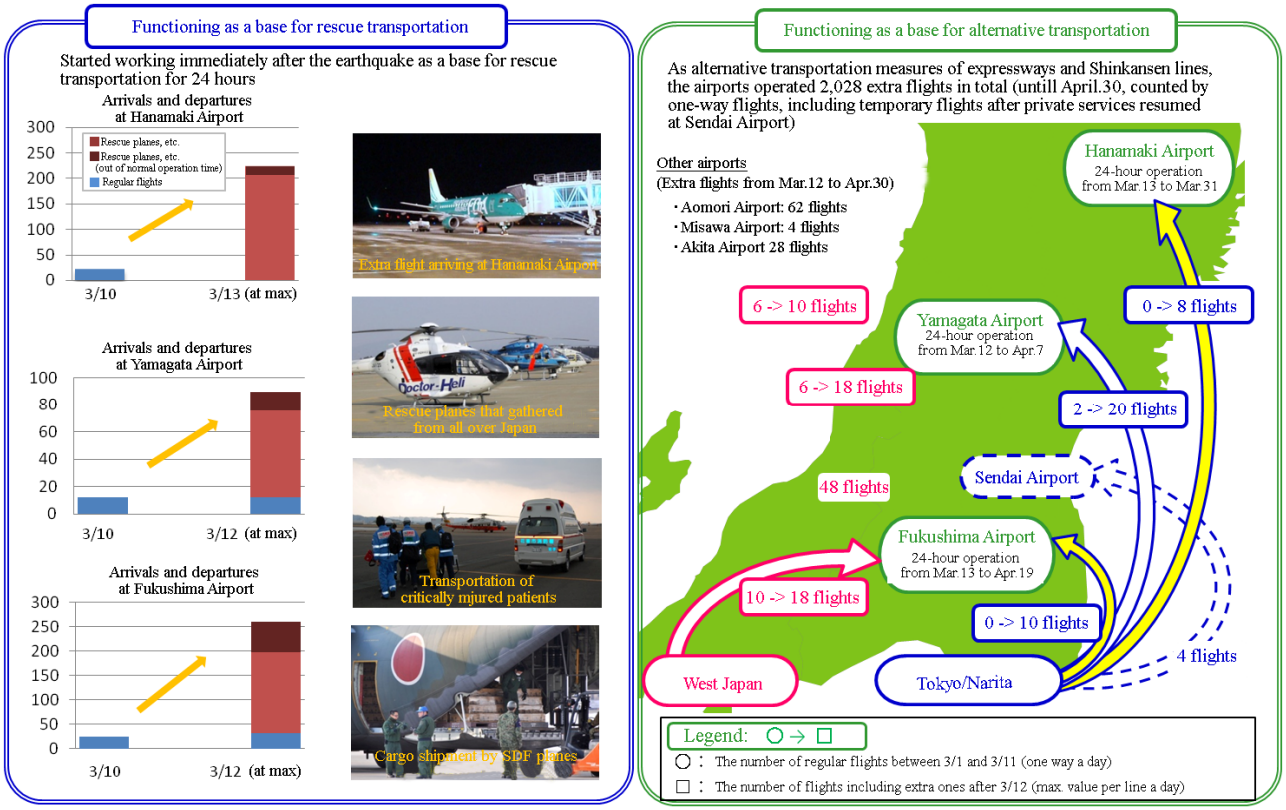
Ryobi Holdings in Okayama had lost 50 of its buses in tidal waves caused by the typhoon in 2004. It was aware from its own painful experience that there were many bus corporations who had lost vehicles. So it approached group companies through the Tohoku Bus Assiciation, and appealed to them to to donate 10 buses if asked.

Two companies, Shiroyama Kanko and Otuchi Chiiki Kanko, responded to the offer, and 3 tour buses were donated to them on April 28. The headquarters and many of the vehicles of the companies that received the donated buses had been damaged by the huge tsunami. The donated buses are being used as school buses, etc., and have been supporting local transportation.

Source: Ryobi Holdings

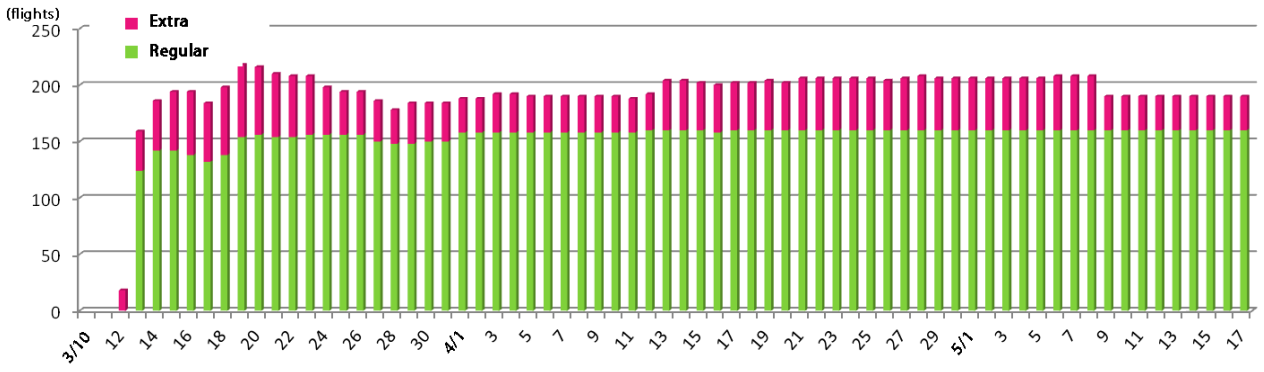
Each airport in the Tohoku region tried hard to secure transportation capability through the operation of regular and relief flights. Ten days after the shock, the number of flights operated surpassed the number of regular flights before the earthquake.

70: Leveraging the Airports in the Tohoku Region as Bases for Relief Activities and Alternative Transportation



Source: MLIT

71: Regular Flights and Extra Flights at 12 Airports in the Tohoku Region (including Ibaraki Airport)



Source: MLIT

Ferry routes connecting Hokkaido and the mainland resumed on March 23 changing the route into between Aomori and Tomakomai, form between Hachinohe and Tomakomai. The route between Sendai and Tomakomai resumed on March 25, but was limited to chassis and trucks with drivers. After that, the RORO ferry route connecting

Hitachinaka and Tomakomai was reopened on alternate days.

As for the ferries for the 9 isolated islands damaged by the tsunami (total number of residents: 5,400), the 4 routes[1] were forced to stop operations because about 50% of their boats were lost or damaged. However, operations were partially resumed to Ishinomaki, Tashiro-jima, and Amichi-jima on March 24. After that, limited operations were restarted for 3 routes. On July 25, the last route was finally resumed.

Column - Ferry Support from Seto Inland Sea Region

The huge tsunami surged into Oshima in Kesennuma City, and caused a great deal of damage to the island which has the largest area and population. About 30 people out of 3,500 who lived on the island were killed or are missing, and a massive fire occurred.

Before the earthquake, 19 ferries a day had been shuttling between Oshima and Kesennuma. However, severely damaged were all the boats owned by the ferry company that was the lifeline of the island. This resulted in the island being temporarily isolated.

In order to deal with such a serious situation, a private organization acted as an intermediary so that a ferry owned by Etajima City in Hiroshima, "Dream-no-Umi" could be leased to the affected ferry company in Oshima. The ferry was put in service between Oshima and Kesennuma on April 27, and it has since been playing a big role in transporting islanders, rescue teams, and daily necessities.

Damage in Oshima

Leased "Dream-no-Umi"

Sources: MLIT (left); National Maritime Research Institute (right)

Column - Information for Volunteers Offered on Expressway or at Station

Since the Great Hanshin-Awaji Earthquake, the concept of volunteerism has been recognized widely in Japan. After the Great Eastern Earthquake, the entry of volunteers was limited because the affected areas had great difficulties establishing acceptance systems, and also because there was a severe shortage of fuels. However, after such systems and traffic access were arranged, the number of volunteers working in the affected areas increased.

In that situation, to offer adequate and timely information about conditions in affected areas or about the latest volunteer recruiting, the "Volunteer Information Center" on the Tohoku Expressway and the "Volunteer Information Station in Sendai/Miyagi" at the JR Sendai Station were opened. Both centers were mainly managed by local volunteers for about a month since mid April, and were well used, especially during "Golden Week"(Japanese holiday week in May).

Source: The Tohoku Expressway Volunteer Information Center

[1] Between Uranohama and Kesennuma; Ishinomaki and Nagato; Shiogama and Houjima; and Onagawa and Enoshima

Restoration of Lifeline Infrastructures

In order to push out waste water from town areas, surveys on whether sewage pipes preserved their flow functions were conducted in the early stages after the disaster. For this research, officials were dispatched from municipalities nationwide to help the affected municipalities figure out the damages quickly. When pipes were damaged or pumping functions were stopped, temporary pipes and pumps were used for ensuring public health.

Among the 120 waste treatment plants that were damaged, those whose damages were relatively less have been temporarily restored; 95 facilities are at least temporarily back to their normal capability of treatment. However, the operation of 16 facilities is still suspended due to damages by the tsunami on their machinery or electric equipment (as of August 8). In 13 plants that received waste water out of the suspended plants, countermeasures have been progressed like temporary treatment by precipitation or sterilization. In addition, the Japan Sewage Works Agency has supported temporary measures and the formulation of a restoration plan in cooperation with related organizations.

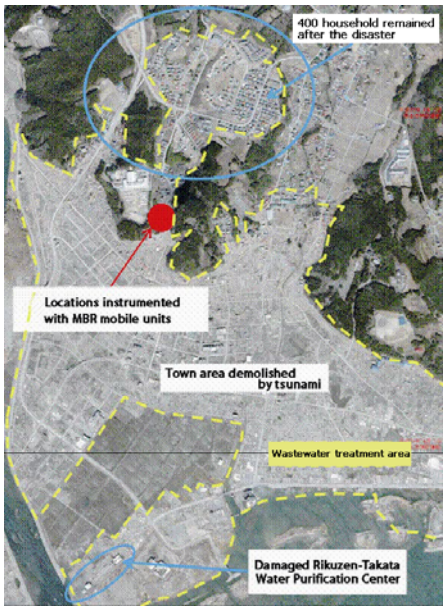
This disaster also revealed new issues such as the cut-off of external power sources and the damages to waste water treatment plants (most of which are constructed in coastal areas). In addition, emergency measures had to be conducted for public health, such as countermeasures against pooled waste water in town areas. Since plans were needed for temporary restoration in case that it took a long time to realize actual restoration, the MLIT announced the basic outline in improving treatment levels step by step.

Column - Early Restoration of Sewage System via Private and public partnership

In Rikuzen-Takata City, a coastal area, the wastewater treatment plant (Rikuzen-Takata Purification Center) was damaged. Fortunately, about 400 households on higher ground suffered little damage. Because the facility and a relay pump station broke down, management of wastewater discharged from the area became an issue.

Accepting a suggestion from Hitachi Plant Construction & Service, the city decided to introduce Membrane Bioreactor (MBR) mobile units. Delivery, installment, and test operation of the system were promptly carried out, and actual operation started within a month. Thanks to MBR, a better technology for wastewater treatment, the quality of treated water has improved. The proposal from a private sector and the quick decision-making of the city resulted in securing a hygienic environment in the affected area.

Wastewater Treatment Area



Source: MLIT

Mobile MBR Unit

Securing toilets is always a big problem for shelters, etc. In Higashimatsushima City, manhole toilets, which were constructed using the Japanese government's support system to promote earthquake countermeasures for sewage system, were put to good use. Since they did not have steps though portable toilets usually do, they were popular especially for elderly people.

72: Manhole Toilet Used at Shelters

Source: MLIT

Securing Housing for the afflicted

Early construction of temporary housing was necessary in order to improve and stabilize life for evacuees and the afflicted. Immediately after the earthquake, on March 14, the Minister of Land, Infrastructure, Transport, and Tourism requested the Japan Federation of Housing Organization to provide 30,000 housing in 2 months. On April 5, the Minister requested the federation to provide 30,000 more housing in the subsequent 3 months.

The number of requests for temporary housing construction was 52,352 (13,983 for Iwate; 22,054 for Miyagi; 16,000 for Fukushima; 10 for Ibaraki; 20 for Tochigi; 230 for Chiba; and 55 for Nagano, as of August 11). [1] The numbers surpassed the requests for housing after the Hanshin-Awaji Earthquake (48,300 for almost 7 months).

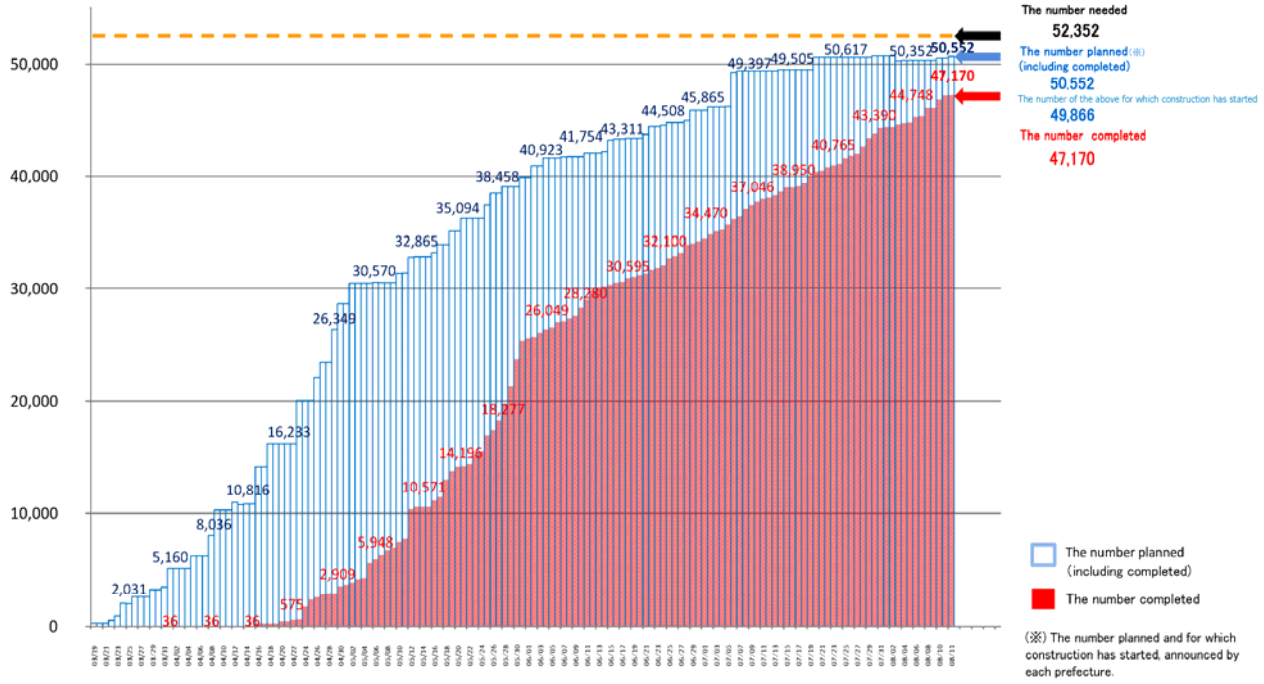
Initial construction for a housing facility was begun in Rikuzentakata City in Iwate on March 19, and on April, it was ready for local residents to move into. As of August 11, the construction of 49,866 housing facilities was begun, and 47,170 in 856 districts have since then been completed.

73: Construction of Temporary Housing

Sources: Rikuzen-Takata City, Iwate (left); Sendai City (right)

[1] As of April 14, the number required was 72,000 (the largest thus far), but it decreased as municipalities' requests were confirmed.

74: Number of Temporary Housing Planned and Completed



Source: MLIT

75: Construction and Occupancy of Temporary Housings in Comparison to the Great Hanshin-Awaji Earthquake

	Constructed	Occupied
East Japan (8/11, 152nd day)	47,170	85,090 *
Hanshin-Awaji (6/21, 157th day)	39,241	36,971

※ Including 49,937 units, the number of units rented from private housing owners as temporary housing for the affected by the Great East Japan Earthquake. In the Great Hanshin-Awaji Earthquake, the total number of rented private housing units was 139. However, the number on 6/21 is unknown.

Source: MLIT

At initial stages of this disaster, access toward the affected areas was difficult. In the areas where towns were destroyed by the huge tsunami, the safe livelihood of evacuees could not be secured, especially with threats of possible secondary disasters due to damages and to the loss of coastal protection facilities. The shortage of flat land on higher grounds made securing building sites for temporary housing difficult. The construction of temporary housings was confronted with issues that were completely different from the case in the recovery from the Hanshin-Awaji Earthquake.[1]

MLIT decided to use land owned by the Japanese government or by other national organizations as building sites, and provided the information needed to support the procurement of those lands. At the same time, MLIT also decided to use farm land or lots owned by private corporations, and offered each prefecture with necessary advice. In Iwate, private land was promoted for use.

Because the tsunami destroyed large coastal areas where there were not only a lot of businesses, but housings as well, MLIT saw how difficult and how time-consuming it is to build temporary housing for the afflicted. It is essential to research and grasp the situations, and to promote necessary measures to be taken in advance.

A shortage in construction materials was initially a concern because of damages on production bases, logistical obstacles, planned outages, etc. Accordingly, countermeasures have been progressed in case there are any problems with securing necessary materials. Examples include MLIT's request to the Japan Federation of Housing Organizations to cooperate in adequate construction orders based on actual demand and restraint of excessive storage in combination with promotion of construction of temporary housings; and its other request to concerned ministries and agencies to collaborate to conduct an emergency survey regarding supply and demand for construction materials.

MLIT supports each prefecture's efforts to promote provisions for local construction business operators (*e.g.* builders' offices) in order to achieve the creation of jobs in and the complete restoration of the affected areas.

From lessons learned after the Hanshin-Awaji Earthquake, the utmost consideration has been made to maintain local communities through temporary housing for the afflicted, especially the elderly. MLIT helps and guides each prefecture, taking into consideration such measures as building a meeting place for those in temporary housing.

MLIT has also tried to use vacant units in rented accommodations such as public housing and the UR (Urban Renaissance Agency) to secure residence for the afflicted.

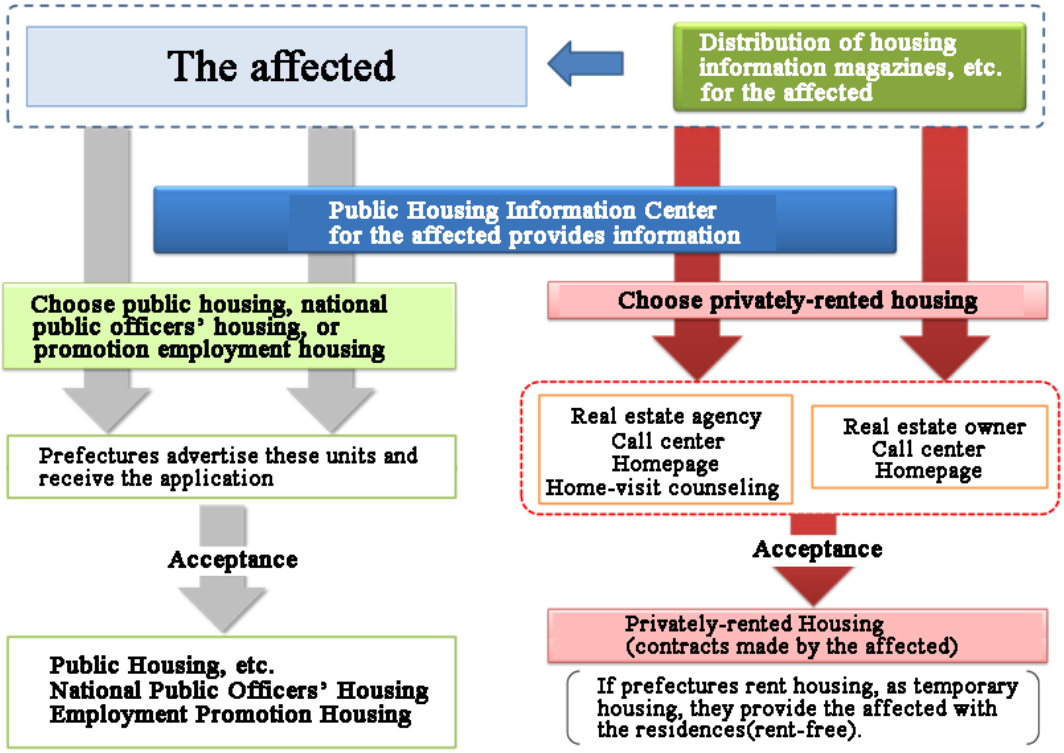
In order to provide information about public housing where the afflicted can live, and to lead applicants to contacts, the "Information Center of Public Housing for Disaster Victims" was set up in the Federation of Housing and Community Center on March 22. This center has promoted support for securing residences, adding private rental housing and national officers' housing on their menu on March 28, as well as public housing managed by local municipalities and rental housings managed by the UR.

These approaches succeeded, and 6,671 units out of the 23,560 vacant public housing, nationwide were occupied. Of the UR-leased units, 839 out of 5,134 had been occupied as of August 8.

Municipalities in the affected areas are allowed to rent privately rented houses and utilize them as temporary housing. As of August 11, 49,937 of such residences had been occupied.

[1]"Tentative measures concerning provision of temporary residences" was enacted in the "review meeting concerning promotion of residence provisions for the afflicted", which was organized under the "life-supporting team for the afflicted" of the Cabinet Office (determined on April 5 and amended on May 18, 2011). In accordance with the policy, provisions for temporary residences have been promoted with the cooperation of related national ministries and agencies.

76: Outline of the Public Housing Information Center for the Afflicted People

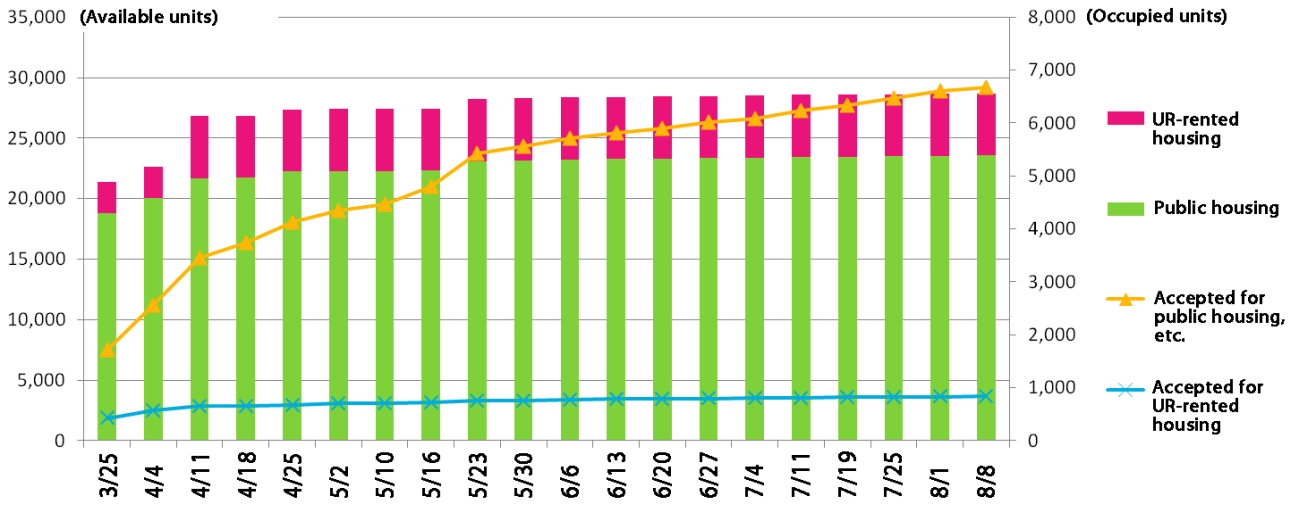


Source: MLIT

In addition, MLIT has been sharing information about available privately leased houses with the afflicted via print advertisement. For example, on April 18, it started publishing a magazine about privately rented accommodations, in cooperation with real estate businesses and private corporations.

Since construction of temporary housing takes a certain time, accommodations at hotels, inns, etc. have been promoted to help alleviate the suffering caused by living in shelters. The Japan Tourism Agency has worked together with related ministries and agencies including the Ministry of Health, Labor, and Welfare to support accommodating victims beyond prefectural boundaries by utilizing the Disaster Relief Act.

77: Availability and Occupancy of Public Housing



Source: MLIT

The number of evacuees taking advantage of accommodations certified as eligible for the Act has been about 24,000 within Iwate, Miyagi, and Fukushima, and about 3,400 in other prefectures (accumulated totals as of July 21).

The private sector has developed support for the afflicted so that they could stay at hotels and inns at special discounted fees.

Column - Village Made an Immediate Decision to accommodate 1,000 People in Hotels

Three days after the Great East Japan Earthquake, Katashina Village in Gumma Prefecture announced it would accommodate evacuees in hotels and inns within the village free of charge under the cooperation of the hotel association. Nearly 1,000 evacuees from Minami-Soma City in Fukushima came to the village, whose population is a slightly over 5,000, and were accommodated at 35 hotels and inns starting March 18.

Villagers were keen to engage in volunteer activities. Local government officials, the hotel association, and local residents worked together to support the afflicted and to offer warm hospitality.

Source: Katashina Village, Gumma

To support the repair and reconstruction of damaged houses, MLIT provided victims with consultation for housing problems via the telephone hotline "Smairu Dial"; carried out free on-the-spot[1] diagnoses and consultations; and offered victims free consultations and estimates by experts (*e.g.* lawyers) to advice them regarding consumer issues. In the Condominium Management Center, a contact point for condominium apartments affected by the disaster was set up, and has been providing consultation relating to disaster damages and planned outages for condominium management associations since March 14.

The Japan Housing Finance Agency has not only improved loans for recovering residences (*e.g.* 0% interest for the initial 5 years) of the afflicted who try to rebuild or renovate their houses by themselves, but has also created loans for those whose lands were damaged. With existing loans, the payment period or the payment postponed period can be extended for up to 5 years and interests can be decreased during the postponed period.

MLIT has also offered other forms of assistance, such as support for the construction of public housing, land acquirement, the development and maintenance of local high-quality homes for the afflicted that can be leased to the afflicted. In addition, it supports the establishment of facilities for the support of livelihood in public housings in order to provide services for the elderly, the handicapped, and families with children.

[1]As of August 11, it had received 10,380 requests for consultation, 5,982 of which were applications for on-the-spot diagnosis and consultation.

3. Securing Immediate and Smooth Recovery

Disposal of Debris

The Great East Japan Earthquake produced a great deal of debris. The debris from buildings destroyed in Iwate, Miyagi, and Fukushima alone has been estimated to be about 22,600,000 tons.[1] The number greatly surpasses that from the Hanshin-Awaji Earthquake (about 14,500,000 tons, excluding debris from public facilities). The rubble impeding livelihood near shelters and residential areas were supposed to be taken away immediately. For such debris, there was a policy to move them to temporary junkyards or intermediate treatment facilities by the end of August 2011[2].

Delay in handling the rubble greatly hampered the normalization of the life of the afflicted and the reconstruction of the affected areas. MLIT has tried hard to remove debris from public facilities such as roads, rivers, ports, etc., and it has also created a policy regarding the treatment of damaged automobiles and vessels. It requested the construction industry to respond immediately to requests from municipalities, and has arranged support systems for municipalities (*e.g.* consultation at the Tohoku Regional Bureau for municipalities that try to remove rubble and need to secure construction machineries or personnel from construction companies).

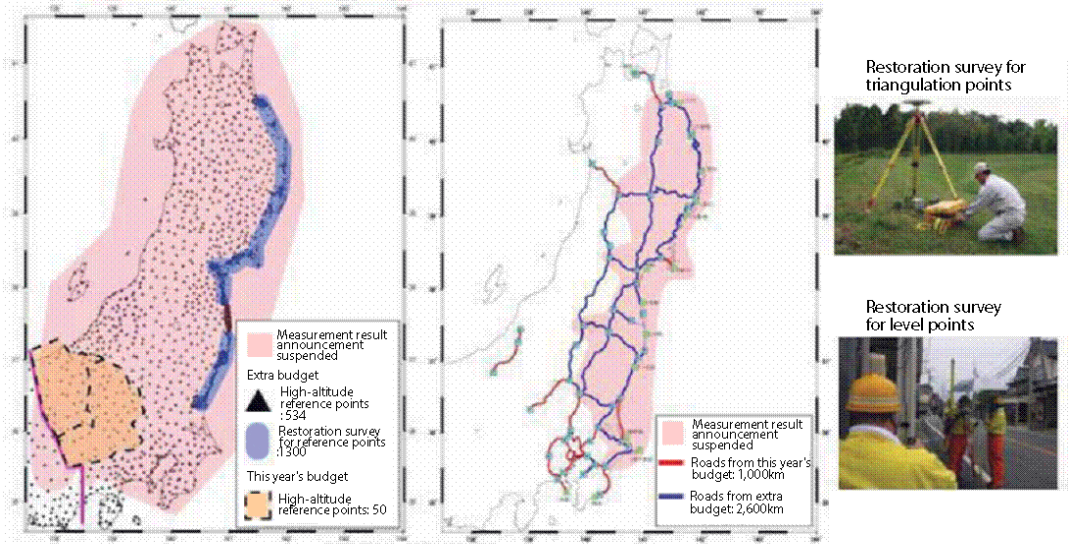
Additionally, it provides local municipalities with information about the kinds of waste that can be accepted and recycled at ports (including MLIT-designated recycling ports) and about possible disposal sites.

In addition, to collect debris that had drifted into the sea and that were impeding boats and ships, MLIT dispatched ocean cleaning vessels that usually collect wastes and oil in closed waters (*e.g.* Tokyo Bay, Ise Bay, and the Seto Internal Sea) to Sendai Bay and coastal waters along Sanriku.

Restoration of Geodetic Reference Points

Since geodetic reference points changed during the disaster as a result of horizontal crustal deformation (up to 5 meters horizontally) and ground sinking, their use has been suspended in wide areas in eastern Japan.[3] These reference points provide location information which that is used as standards for public land measurement and demarcation cadastral data by the Japanese government and local municipalities. If this information is inaccurate, restoration activities of public infrastructures would be greatly affected. Thus, the Geographic Survey Institute has actively progressed restoration of geodetic reference points.

78: Recovery of Geodetic Reference Points



Restoration survey area

*** These are schematic drawings, excluding the no-tresspassing area of the Fukushima Nuclear power station.**

Source: Geospatial Information Authority of Japan

[1] Based on identifying inundated area with satellite image, Ministry of Environment estimated amount of rubbles from fallen houses etc. As for municipalities where almost all the debris has been carried in temporary junkyards, the amount was estimated based on the carried-in amount (as of August 2).

[2] Issues regarding the disposal of disaster wastes were sorted out and discussed at the "council for review and promotion regarding smooth handling of disaster disposal, etc." that consists of related ministries and agencies, and which was created under the Japanese Government's "Support Team for Livelihood of the Afflicted".

[3] Geodetic reference points whose result could not be used reached about 44,000 of triangulation points and about 1,500 of level points.

Along coastal areas, hydrographic data has been unclear due to massive topographic deformation. The data is the standard for water depth on sea charts, and thus, are essential for drawing construction plans of port facilities. Inaccurate information would greatly hinder safety for marine traffic and restoration activities. The Japan Coast Guard has been progressing works to determine hydrographic data and to reflect them on sea charts.

Land Demarcation

To premote various restoration activities in affected areas, land demarcation is very important. If cadastral survey is done to confirm location and the boundaries of each land parcel, smooth operation can be implemented. Whether cadastral survey is done or not produces big differences in time needed for and costs of restoration of public infrastructures.

For demarcation in the areas where cadastral survey has been completed, the results can be utilized. Cadastral survey has been carried out in about 90% of the land inundated by the tsunami. However, crustal deformation makes a difference between the results of cadastral surveys and the actual places. Therefore, MLIT will amend the gap by reproducing geodetic reference points to restore the results of cadastral surveys and contribute to disaster-relief activities.

In areas where cadastral survey has not been conducted, land boundaries are unclear. It consequently take much more time and costs more for land owners to determine borderlines than for land owners in surveyed areas, which is one of the factors hindering restoration of the affected areas. It is effective to clarify at least the boundaries between privately-owned land and roads(borders between public and private land) in such areas. In order to advance restoration of public facilities, the Japanese government directly conducts the clarification works between public and private lands.

Securing Labor and Equipment Needed for Restoration

Many local construction businesses in the affected areas were victims of the Great East Japan Earthquake, while they had been in severe financial conditions before it occurred. Although their support and cooperation are essential for restoration of public infrastructures, they have been difficult to secure workforce and construction equipment needed for relief activities under such a huge disaster.

Furthermore, securing necessary construction materials became a problem. The supply of housing construction materials needed for temporary housing is not the only concern at a moment; the supply of fuel and some materials required for restoration of public infrastructures is also a concern.

MLIT requested 127 entities (*e.g.* the construction industry association and the material business association) to procure construction machineries and equipment, and to secure labor on March 12, a day after the disaster. On March 29, it required those entities to stabilize supply by conducting proper orders based on actual demand, restraining excessive inventory holdings, and refraining from speculative stocks. Furthermore, public and private sector collaborated to take measures to support local construction companies in the affected areas and to secure construction materials with consideration to the balance of supply and demand, in order to promote immediate and smooth disaster-relief projects in the affected areas.

In concrete terms, MLIT has taken measures through

79: Support Booklet and Flyer for Construction Companies

Source: MLIT

the national government and the municipalities to suspend public works as necessary and to make the advance payment guarantee system more flexible so that construction businesses can conduct cash management well. It also prepared brochures summarizing governmental support policies regarding finance and employment of construction companies, and information contacts. Furthermore, it set up a hotline for construction operators.

As for measures regarding construction materials, MLIT has reinforced systems to collect and provide information. For example, it utilized the "Local Liaison Meeting on Measures for Construction Materials" – which is set up in each MLIT regional bureau and which consists of prefectures, construction industry associations, material business associations for information exchange, and it has created information contacts for construction materials. MLIT has also taken measures such as sharing information about construction materials with the Ministry of Economy, Trade and Industry, and Forestry (which also administrates the production and distribution of construction materials) to secure the balance of supply and demand of materials.

4. Accidents of the TEPCO Fukushima Nuclear Power Plants; Responding to Economic Damages

The Japan Coast Guard deployed patrol boats to sea around the TEPCO Fukushima Daiichi nuclear power plant for the safety and security of maritime transport routes connecting Hokkaido, the affected areas, and the Capital region and the west.

To quell harmful rumors regarding the accidents of the nuclear power plants, MLIT has been working on providing information about safety and the radiation levels at ports and airports and sharing news to foreign countries.

In concrete terms, MLIT provides accurate information on its website about radiation levels at ports (including Keihan Port) in Japanese, English, Korean and Chinese, and it takes measures to issue certifications on radiation level of containers and ships, based on request from maritime companies. The Japanese Shipowners' Association and others notify related corporations and crews about such approaches. Such information is announced to foreign governments, port authorities, maritime corporations. Through the foreign embassies and the press in Tokyo, as well as through Japanese diplomatic missions abroad. MLIT also publicizes the radiation levels measured at main airports on its website (in Japanese, English, Korean and Chinese), and tries to communicate information through various public relations networks.

80: Logo Mark for Domestic Tourism Promotion Campaign through public-private partnership

Source: Japan Tourism Agency

For the tourism industry, MLIT has called for related entities to collect accurate information and to provide travelers with accurate and adequate information since immediately after the earthquake. It has also has been working on building an atmosphere in which Japanese people can take trips. On April 21, it started the "domestic tourism promotion campaign" in cooperation with public and private sector in order to promote disaster-relief support activities through travels and trips. It has been trying to arouse national tourism with the "Hold on! Japan!" campaign and the catch phrase, "Make Japan's summer cheerful with smiles on travels."

MLIT has posted travel information to support eastern Japan, as well as tourism information from private corporations and local communities, such as summer holiday travels on the website managed by the Japan Travel and Tourism Association. Other advertising efforts have been: notifying newspapers about such information, applying posters in public locations, and using word-of-mouth communication, etc.

For foreign visitors, disaster-related information such as the conditions of traffic infrastructures, radiation levels have been offered accurately on the website of the Japan National Tourism Organization (JNTO) in multiple languages since immediately after the quake. Since April, information about daily life in Japan, which is hard to see from overseas, has been shared via video clips in order to try to restore tourism to Japan. In addition, MLIT has invited press and tourist agencies from 15 countries and regions as part of the "Visit Japan" project to show them that most of the affected areas are back to normal and to encourage them to promote Japan as a tourist destination.

As a result of these efforts, countries have reconsidered and recalled their recommendations to their citizens to restrain from visiting Japan. Since the end of April, preliminary tours of media and tourist agencies in Asian countries have taken place, and Japan tours for foreigners have shown signs of recovery.

Because of the disaster, many international meetings have been cancelled or put off nationwide. Administrators of the Japan Tourist Agency sent letters to organizers to reconsider their cancellations of international conferences.

It is also necessary to implement long-term plans to create and maintain environments with which foreign visitors can be satisfied. Thus, MLIT has tried to strengthen hospitable environment through measures such as an hospitality supporter project utilizing foreign students.

5. Challenges toward Restoration of the Affected Areas

Among the areas damaged by the Great East Japan Earthquake, each area has its respective circumstances caused by the devastating damage in town areas; ground sinking; the risks of secondary disasters due to damages on sea

embankments; the influence of nuclear power plant accidents; etc. Therefore, it is not possible to lump every local area together as “the damaged area", and the restoration approaches are greatly varied for each area. Especially in the areas where people have been forced to evacuate and live in different towns for a long time due to the nuclear accidents, the effects of disaster are felt even now. People are urging for the problems resulting from the nuclear accidents to be remedied completely so they can finally return to their homes. However, the affected areas have been facing great impediments in their restoration efforts.

On another front, local communities have started their efforts to rebuild and revitalize their areas depending on their actual circumstances. On April 11, Iwate and Miyagi prefectures announced the "Basic Policy for Restoration from Tsunami Damages Caused by the Great East Japan Earthquake" and the "Miyagi Prefecture Basic Policy for Disaster Relief (Draft) – Links In and Among Miyagi, Tohoku, and Japan: from Revitalization to Further Development“, respectively. Fukushima prefecture also started to formulate a policy for restoration.

On the same day, April 11, the Japanese government created the "Advisory Committee Tasked to Work Out a Vision on Countermeasures for the Great East Japan Earthquake" to discuss the restoration of the affected areas.

Iwate prefecture then formulated the "Basic Plan for Restoration – Protecting Lives and Living with Sea and Land: for Creation of Our Hometown, Sanriku, Iwate-" and the "Implementation Plan for Restoration (Part 1)" as part of the "Basic Policy for Restoration from Tsunami Damages Caused by the Great East Japan Earthquake”. Miyagi prefecture announced the 1st and 2nd drafts of the "Miyagi Prefecture Plan for Restoration from Disaster – Links In and Among Miyagi, Tohoku, and Japan: from Revitalization to Further Development", and the restoration plan is to be formulated in September. Fukushima prefecture formulated the "Vision for Restoration in Fukushima Prefecture", and it has been working on the "Restoration Plan" in which concrete approaches and principal projects are to be described.

Municipalities in the affected areas have also been progressing work to formulate their restoration plans, even though their situations are different depending on their circumstances.

The Advisory Committee Tasked to Work out a Vision on Countermeasures for the Great East Japan Earthquake announced the "7 Principals for Restoration Vision" on May 10 and organized the "Proposal for Restoration – Hope in Disaster". After enforcing the "Basic Law for Reconstructing Areas Hit Hard by the Great East Japan Earthquake", the Japanese Government created the Task Force for Restoration from Disaster by the Great East Japan Earthquake and formulated the "Basic Policy for Restoration from Disaster by the Great East Japan Earthquake" on July 29.

In accordance with the above approaches, MLIT has repeatedly discussed measures to support the affected areas, from temporary countermeasures to restoration, and has announced the "MLIT Approaches for Reconstruction and Restoration from the Great East Japan Earthquake"[1]. The four principles that are comprehensively developing policies depending on the issues of each affected area, are: the rebuilding and securing of livelihood of the affected; town rebuilding with new concepts; revitalization of local industries and economies, and supporting city and traffic infrastructures; rebuilding national land structures to make them disaster-resistant.

This shows how to formulate town reconstruction plans in order to create local-centered visions, and the orientation for restoration and maintenance of city and traffic infrastructures that support the revitalization of local industries and economies. It is based on requests of the affected municipalities that the Japanese Government should urgently outline how to progress restoration and revitalization in the future (*e.g.* the vision for building a safe and tsunami-resistant town, infrastructure preparation, etc.).

Furthermore, MLIT created the MLIT Task Force for Restoration from the Great East Japan Earthquake, with the Minister as chief of headquarters, in order to immediately and smoothly promote its policies regarding restoration from the disaster. It is to work together with restoration support from all those concerned in Government.

One thing learned from this unprecedented tsunami disaster is that it is necessary to take measures for the areas where conventional hard measures cannot provide protection from huge tsunamis. Therefore, MLIT has to create systems to promote "tsunami-resistant town building" by "multiple protections" combining hard and soft policies with consideration to the characteristics of each area. In accordance with prefectures and municipalities creating their restoration visions, MLIT is to build a systematic framework to promote the construction of tsunami-resistant towns.

As part of that, on July 6, the Planning section of the Traffic System Subcommittee of Council for Transport Policy and Social Capital Development Council of the MLIT announced the "Concept for Building Tsunami-Resistant

[1] By the instruction of MLIT, created was the "MLIT minister review meeting regarding restoration and reconstruction of the affected area", with the Junior Minister as chairman. It carried out meetings and hearings with concerned academics a total of 8 times.

Towns". It categorized concepts for tsunami disaster protection and reduction, such as combining hard and soft policies by innovative ideas based on the principle of saving lives through town building, trying to secure safe and immediate evacuation, etc. It also made concrete issues clear and showed proposals for them. It also discussed the following: the nation's role, the sharing of disaster information, mutual communication, the formulation of specific evacuation plans, land usage, restrictions on construction structures, the creation and maintenance of tsunami protection facilities, systems for early restoration and reconstruction, and systems to promote the comprehensive design and building of tsunami-protected towns.

By realizing and embodying the visions and proposals for various reconstruction in order to rebuild livelihoods and restore the damaged areas as soon as possible, MLIT has a great and important role to take on. Its goals include town building, industrial revitalization, the creation of infrastructures that support the restoration efforts, traffic, housing, etc. MLIT will progress its approaches in cooperation with the affected areas and with consideration to the issues and problems which have arisen in various places and on various occasions.

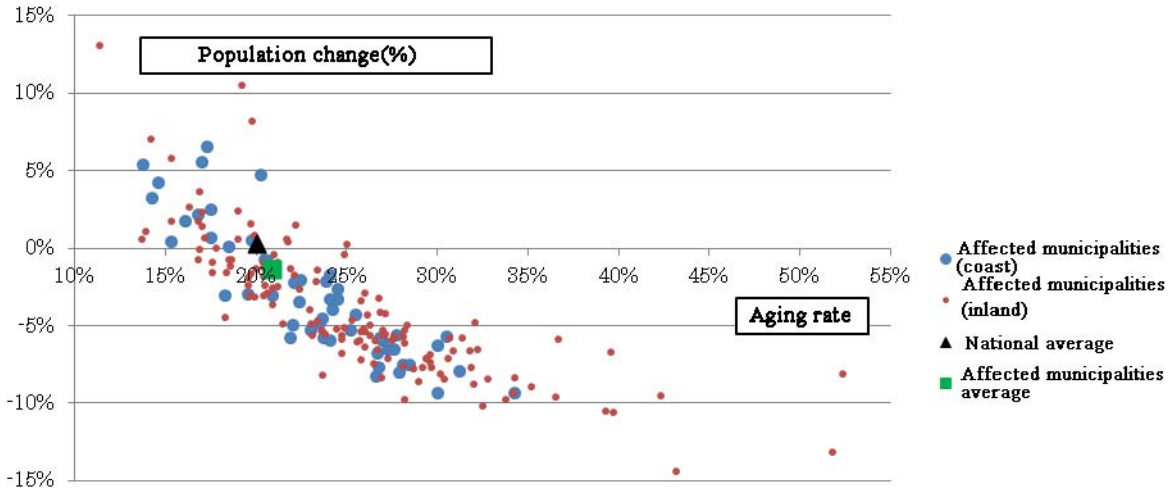
Social and Economic Situations in the Affected Areas

The areas affected by this disaster, especially those along the coast that were devastated by the tsunami, are facing increasing economic and industrial deterioration. Among those areas are many where the elderly population (65 and older) is more than 30% and where the total population has decreased by more than 5% in the last 5 years. The demographic shift due to depopulation, a decreasing birth rate, and an aging society has been progressing in the local communities. The damages from this disaster made the situation worse in those areas that cannot attract, circulate, or lose manpower, materials, and funds.

Smaller municipalities (in terms of population) have a higher ratio of agricultural, forestry, and fishery industries, but also a higher aging ratio. That translates to a lower financial capability index.

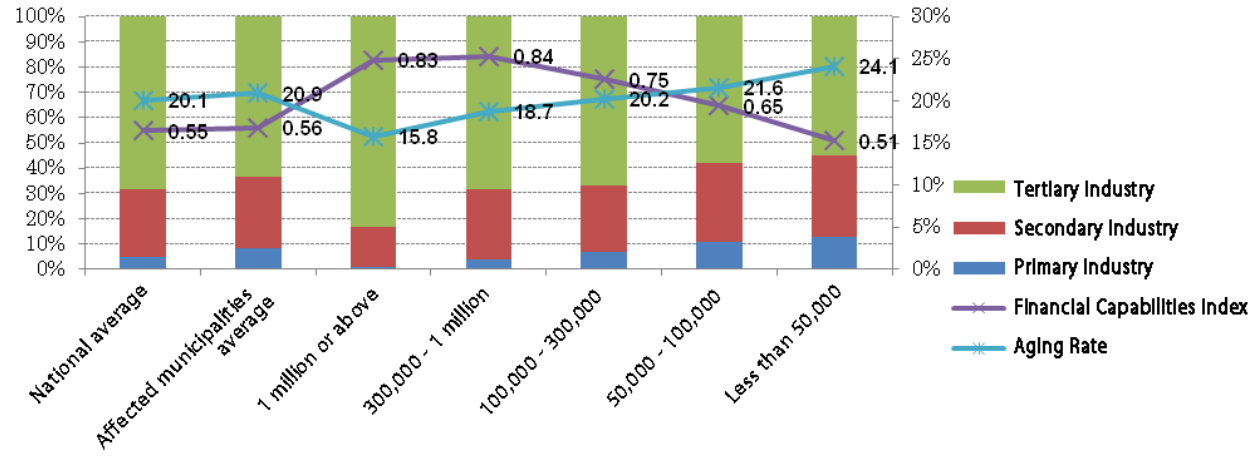
Considering the situations in the affected areas, it is necessary to promote reconstruction by revitalizing and creating new power to help them reconstruct and restore their communities. One of the goals is to give victims' employment first priority so that they can support their own restoration strategies, and industries such as agriculture, forestry, fishery, manufacturing and tourism can be revitalized using the areas' unique local resources.

81: Aging and Decreasing Population in the Afflicted Areas Damaged by the Great East Japan Earthquake



Notes
1. Affected municipalities are the ones to which are applied the Disaster Relief Act on the Great East Japan Earthquake in Iwate, Miyagi, Aomori, Ibaragi, Tochigi, and Chiba and where aftershocks intermittently occurred after the main shock on March 11, and where many people were harmed or their lives and threatened, evacuated, and need constant support and help.
2. "Population change" is the rate of change between 2005 and 2010. "Aging rate" is from data from 2005.
Source: MLIT, based on "National Population Census" of Ministry of Internal Affairs and Communication

82: Industrial Structure, Aging Rate, and Financial Capabilities Index of Affected Municipalities (grouped by size)



Notes 1. Affected municipalities are entities to which are applied the Disaster Relief Act on the Great East Japan Earthquake in Iwate, Miyagi, Aomori, Ibaragi, Tochigi, and Chiba where aftershocks intermittently occurred after the main shock on March 11, and where many people were harmed or their lives threatened, evacuated, and need constant support and help.

2. "Workforce by industry" and "aging rate" are from data of 2005; "financial capability index" is from data of 2007.

Source: MLIT based on "National Population Census" of Ministry of Internal Affairs and Communication

Building Safe and Secure Towns for the Maintenance and Revitalization of Communities

For reconstruction of the affected towns, it is necessary to promote town building based on the concept that the damage varies from one area to another while safety is secured as much as possible for the areas are threatened with secondary disasters (*e.g.* aftershocks, another tsunami, and further problems from the nuclear power plant accidents). In the restoration processes of past disasters like the Hanshin-Awaji Earthquake, the isolation of victims due to the disintegration of conventional communities was a serious problem. With the areas affected by this disaster, it is necessary to take into consideration that aging has progressed more since the Hanshin-Awaji disaster and to take approaches to maintain and rebuild their communities, avoiding such community disintegration as much as possible.

Above all, it is desired that all policies are driven forward together to promote the building of tsunami-resistant towns based on lessons learned from the massive tsunami. Especially for the areas that suffered great destruction and need new comprehensive town building for their restoration, it is necessary to take special measures regarding land use and restructuring so that existing systems concerning land use (*e.g.* city planning) will not be great restraints.

It is also necessary to rebuild traffic networks in each area, including the restoration of public transportation to support local residents, as well as to try to restore infrastructures as the foundations for safety and relief as soon as possible.

The first step for victims to get their lives back to normal is to secure permanent residences with the help of provisions for temporary housing, etc. When implementing these projects, it is necessary not only to take care of securing safe living environments depending on the damage conditions in each area, but also to thoughtfully ensure that housing for the elderly are safe.

Knowledge and creativity are required for restoration efforts. Considering the scale of the damage resulting from this disaster and the severe financial condition, approaches and measures of not only public investment but also private investment are being taken, including works in cooperation with the private sector. It will be more necessary to promote PPP (public-private partnership) or PFI (private finance initiative), which utilize private knowledge and funds, over every step of the planning, implementation, and management of long-term town restoration projects. In addition, it is desirable to support activities of various bodies such as local enterprises organizations and NPOs cooperating with municipalities in order to effectively carry out soft policies, organizations and NPOs concerning the maintenance and restoration of communities.

Column - Recovery from Tsunami Disaster Caused by Off South-West Hokkaido Earthquake (Okushiri Island, Hokkaido)

Okushiri Island suffered great damage, such as 198 casualties and missing persons, demolished settleveits, etc. due to the huge tsunami that was caused by the Off South-West Hokkaido Earthquake in June 1993. The local and national goverments promoted town reconstruction with consideration to disaster protection. Listening to the requests of local residents, they built embankments behind coastal levees that can withstand tsunamis, repaired roads, built shelters, etc. so that residents could return to their former neighborhoods. As for other areas, residents were moved into new housings on higher ground.

Source: Okushiri Town, Hokkaido

Column - Town Restoration and Community Rebuilding (Kobe City, Hyogo)

As a result of the Great Hanshin-Awaji Earthquake, 80% of the buildings in the Matsumoto district of Hyogo Ward collapsed. A Town Building Council was created 4 months after the earthquake so that residents could propose ways to reconstruct the town based on their experiences with fires during the earthquake. One example is "Seseragi", a beautiful stream that runs along the streets and utilizes highly-treated waste water. Residents-led community building was promoted as the Council made an agreement with the city about the management of "Seseragi". The residents regularly clean their neighborhood.

Source: Kobe City, Hyogo

Consistent Implementation of the "MLIT Approaches for Restoration and Reconstruction from the Disaster by the Great East Japan Earthquake"

Based on the problems that have been mentioned, MLIT showed orientation of a concrete policy in the "MLIT Approaches for Restoration and Reconstruction from the Great East Japan Earthquake". Its ideas are used in the Japanese Government's "Basic Policy for Restoration from the Great East Japan Earthquake".

First, "restoration and stabilization of victims' livelihood" is to be pushed forward to balance the urgent rebuilding of livelihood and time-consuming town building. In order to secure safe and untroubled residences, MLIT not only comprehensively supports to develop residential sites, to supply affordable residences, and to maintain public facilities, but also promotes the securing of residences and town building with consideration to the elderly and local communities, and support for residence rebuilding though the decrease of interest rates for housing loans and the reduction of loan defrayments. In addition, for the areas where large-scale land embankments collapsed or where liquefaction occurred, MLIT promotes the notification and application of enhanced support policies for land owners,

and secondary disaster protection for social foundations including city infrastructures. Furthermore, it is pushing forward the restoration and reconstruction of damaged train networks, as well as the securing and maintenance of public transportation (*e.g.* buses, ferries for isolated islands, etc.) in the affected areas.

Second, MLIT promotes the construction of safe and comfortable towns by integrating both hard and soft policies such as "town restoration and reconstruction by new innovative ideas". For this, MLIT is going to create a system to promote "tsunami-resistant town building" by changing ideas for town building from "one-line protection" to "multi-line protection", based on the building of local communities whose backbone is to "escape". Discussions about concrete policies for the promotion of the system have been progressing. In addition, MLIT has been reviewing the suspension of existing land use plans, a "one stop" system to implement approval procedures and the management of lands whose owners are unknown in order to promote integrated land use adjustments of urban areas and farm lands. Furthermore, MLIT supports such town building with manpower, technology, and information, and promotes approaches such as PPP (public-private partnership).

Third, keeping in mind that industrial restoration in the Tohoku area directly affects Japan's economic revitalization and the securing of international competitiveness, MLIT not only tries to implement early restoration of city and traffic infrastructures as part of the "revitalization of industry and economy, and the support of city and traffic infrastructures" , but also promotes support of early restoration and reconstruction of the shipbuilding industry that is essential to the marine products industry, and an early reinstatement of MLIT related industries such as the management and maintenance of trucks, commercial warehouses, construction facilities, automobiles, etc. Moreover, MLIT is pushing forward the urgent management of the restoration roads and restoration-supporting roads that are necessary for the restoration of the affected areas (*e.g.* roads along Sanriku coastal areas); the creation and maintenance of port facilities that will be resistant to earthquakes and tsunamis; and the active development of tourism promotion policies such as the recovery of tourism demands inside and outside of Japan.

Fourth, MLIT progresses not only the restoration and reconstruction in the affected areas, but also promotes approaches with consideration to predictions of another big earthquake occurring in the future and the "reconstruction of disaster-resistant national land". It also progresses reviews on policies from regional wide scale, the development and management of infrastructures with higher readiness for disaster, and the creation of a flexible national spatial structure that can withstand disasters as a whole or as local communities.

Chapter 2: Issues with Building Disaster-Resistant National Land

Section 1: Overhaul Needed for Disaster Management, Utilizing Experience and Knowledge Gained from the Great East Japan Earthquake

Approaches Integrating Hardware and Software

Seeing the catastrophic damages caused by the Great East Japan Earthquake, it was once again recognized that Japan will not develop sustainably without ensuring the security and safety of national land and region. Thus, the security and safety of national and regional land are essential for people's livelihoods and for economic and industrial activities.

It is impossible to control natural disaster completely. The risk for natural disasters has been increasing due to the changes in natural conditions, and new issues have emerged due to the shift in the social environment (*e.g.* the aging population). We need to make ceaseless efforts to minimize disaster damage by reducing social vulnerability to natural disasters such as progressing preliminary preparations with various knowledge and creativity under severe financial circumstances.

In order not to repeat the damages that were suffered in this earthquake, we must make good use of the lessons we learned this time, which will be researched and verified in various occasions for building disaster-resistant national land.

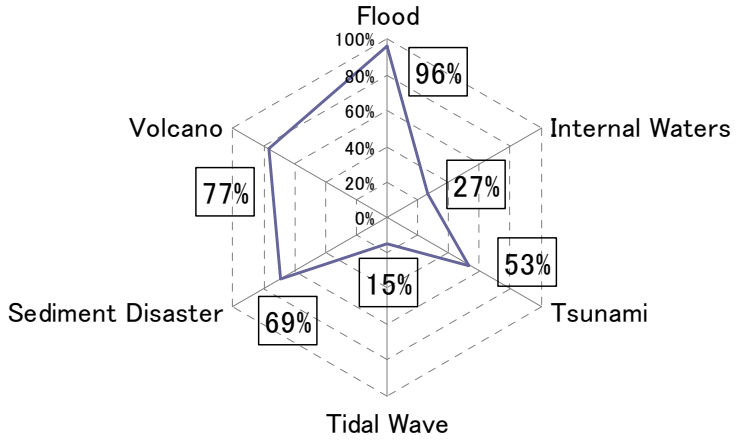
The tsunami caused by the Meiji-Sanriku Earthquake in 1896 resulted in 20,000 lives lost. In 1933, the same area was hit by a tsunami caused by the Showa-Sanriku Earthquake; it resulted in 3,000 deaths and missing-person cases. There were 40 years of time between those two earthquakes. People in 1933 had forgotten the severity of the disaster and had little vigilance for the tsunami, which worsened the devastation. Since the Showa-Sanriku Earthquake Tsunami, even though various policies had been established, such as the preparation of breakwaters and levees, land use regulations, the relocation of facilities and buildings to higher ground, the organization of evacuation systems, some measures had not been completely taken because of short-sighted avoidance of inconvenience in everyday lives in the lapse of a long period of time. Considering such cases, we recognize what is the most important thing to do is to deduce knowledge from past experiences and learn how to implement continuous countermeasures against disaster risks.

Conventional approaches against huge earthquakes first clarify characteristics of possible earthquakes such as the Tokai or Tonankai earthquake, the Nankai earthquake, and the capital central earthquake, as well as a trench type earthquake around the Japan Trench and the Kuril Trench, and estimate possible damage. Then, concrete targets to reduce such damages are decided upon and countermeasures to achieve the targets are taken.

The importance of the strategy for earthquake protection has not changed.

As one of the lessons learned from the Great East Japan Earthquake, it is necessary to minimize disaster damage caused by natural disasters of the utmost scale through both hard and soft countermeasures on the presumption that natural disasters cannot be restrained by only hard measures.

83: Hazard Map Preparation



Note: Flood: 1291 municipalities out of 1342 (as of the end of March 2011); Internal Waters: 146 out of 550 (as of the end of March 2011); Tsunami: 349 out of 653 (as of the end of March 2010); Tidal Wave: 99 out of 639 (as of the end of March 2011); Sediment Disaster: 1115 out of 1613 (as of the end of March 2011); Volcano: 36 volcanoes out of 47 (as of the end of March 2010)
Source: MLIT based on materials from the Cabinet Office

Hard measures play an important role in protecting people's lives and livelihoods from disaster. It goes without saying that disaster protection projects should be progressed by focusing on effective

ones for damage reduction such as improvement on the earthquake-resistant housings and public facilities, flood control, seacoast protection.

As for soft measures, issues and problems to be improved or reinforced are still being accumulated such as the monitoring of various disasters and observation systems; the enhancement and reinforcement of immediate communication systems for disaster and evacuation information; the preparation and enhancement of hazard maps for sharing local disaster risks. [1]

Along those approaches, it is important to prepare detailed and flexible response systems and structures in advance, including immediate and smooth evacuation and rescue, support for victims, and further restoration and reconstruction of damaged areas.

This cannot be realized in a day. However, it is necessary to accumulate continuous measures without forgetting the lessons learned in this disaster.

Reinforcement of Cooperation through Self-Help, Community-Help, and Public-Help

For realizing disaster-resistant national land, not only national and local governments, but also various entities are required to review the best preparations that they can perform depending on each of their roles. After the earthquake, there was a great deal of efforts made by people, enterprises, volunteers to aid victims. For reducing disaster damage, the triple approach of self-help, community-help, and public-help is fundamental.

Especially in such situations where local communities have been losing their powers and capabilities both in urban areas and countrysides, and their disaster protection function accordingly has been weakening, it will be necessary for each community to amass daily approaches to figure out various and unique disaster risks, and to analyze factors that enlarge damages, in order to share knowledge regarding disasters, to prepare concrete measures for avoiding risks, and to carry out drills as they deepen risk communication among those who are concerned.

Through such approaches, local capabilities of protecting themselves from disasters should be enhanced so that the foundation of damage reduction is that local people protect their own community.

[1] MLIT publicized the "MLIT hazard map portal site" (http://disapotal.gsi.go.jp/) where anyone can browse all the hazard maps of Japan. Also, local municipalities have taken forward-thinking approaches. For example, Tokyo metropolitan government announced the results of local risk measurements in regards to earthquakes (risk level for each town of each municipality within Tokyo).

Section 2: Urgent Issues with Preparations for Future Disasters

Japan locates in one of the most disastrous lands in the world, where various natural disasters can occur: earthquakes, tsunamis, volcanic eruptions, storms and floods, heavy snows, etc. It has therefore promoted measures to decrease social vulnerability against such disasters and to reduce damages by reinforcing disaster countermeasures in each step (protection, temporary restoration, and reconstruction and restoration) based on a myriad of past experiences.

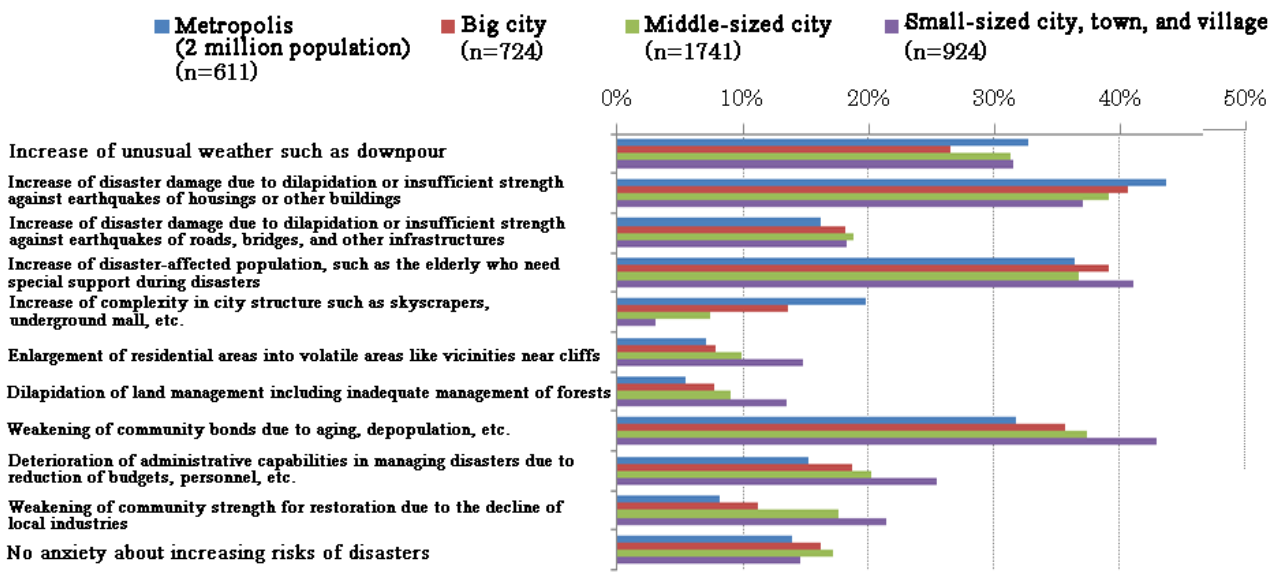
A natural disaster may hit Japan at any time. Experts point out the urgency of the Tokai, Tonankai, or Nankai earthquakes and of trench-type earthquakes that may possibly cause huge tsunamis. Japan can not avoid the danger of great earthquakes (*e.g.* the capital central earthquake) or massive tsunamis, and the devastation they would cause if they occur. There are other disaster risks due to changes in natural conditions, like the increased frequency of heavy rain caused by global warming.

In social aspects, new approaches are required because of an aging society, local depopulation, and shifts in city structures, etc.

According to the survey[1] conducted by MLIT in February in 2011 (hereinafter called the MLIT survey), more people pointed out factors causing disaster risks to increase: "dilapidation or insufficient strength of houses or other buildings against earthquakes", "increase of disaster-affected population like the elderly", etc. In smaller municipalities, more people were concerned about the "weakening of community bonds due to aging, depopulation, etc.", "deterioration of administrative capabilities of managing disasters due to reduction of budgets, personnel, etc.", and "weakening of community strength for restoration due to decline of local industries". In large cities, more people were concerned about the "increase of complexity in city structure such as skyscrapers, underground malls, etc."

84: Factors Worsening Disaster Risk (Results from MLIT Opinion Survey)

Q: Do you think disaster risk has risen or will rise in the future in your neighborhood? Choose all risks you feel anxious about.



(Note) "Metropolis" means wards in Tokyo and government-disignated cities with a population of 2 million or more. "Big city" means government-disignated cities with a population of less than 2 million. "Middle-sized city" means cities with a population of 100,000. "Small-sized city" means cities with a population of less than 100,000.

Source: MLIT.

[1] This survey was conducted in February 2011, and targeted 4,000 people, males and females over 20 years old all over Japan via the Internet. In order not to cause bias due to area, generation, or sex, allocations were implemented according to the actual population composition ratio.

1. Increase of Natural Disaster Threats

Earthquakes are Possible to occur Anytime and Anywhere; Imminence of a Huge Earthquake and Tsunami

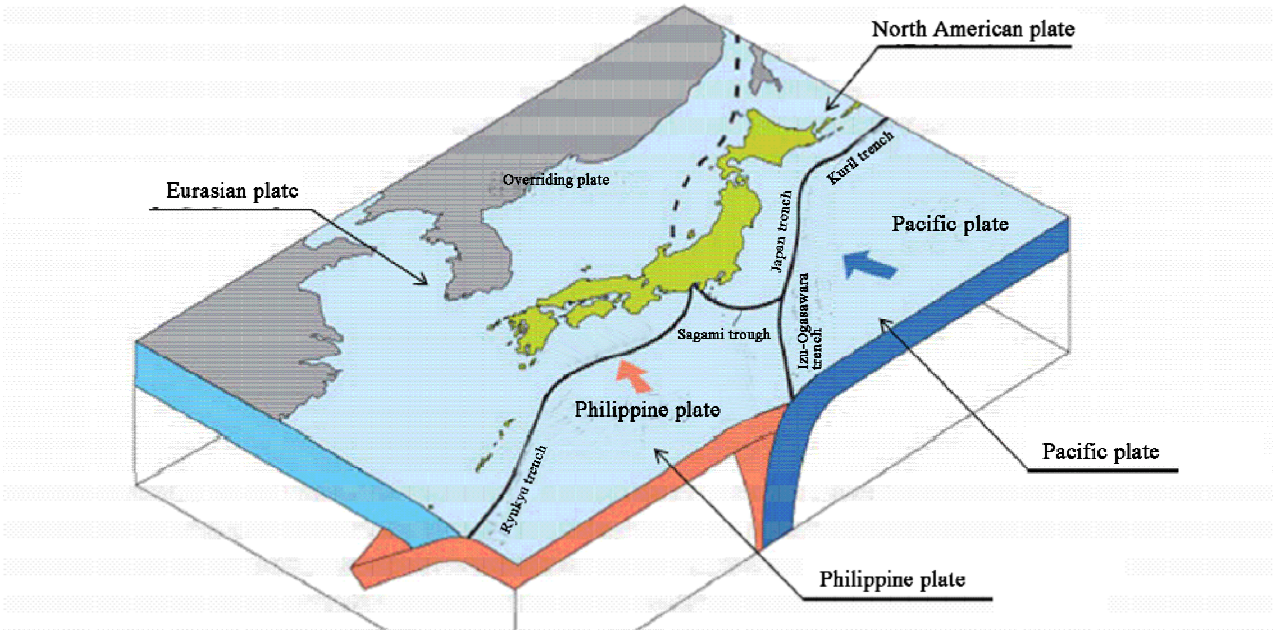
The area around the Japan islands is located over 4 plates where more than 20% of earthquakes of magnitude 6 or stronger occur.[1]

Of particular concern are imminence of huge earthquakes like trench-type earthquakes or like the Tokai, Tonankai, and Nankai earthquakes which would devastate widespread areas, and the capital central earthquake predicted to hit the metropolis of Tokyo. Experts point out their imminence based on past occurrence cycles.

According to a survey by the Headquarters for Earthquake Research Promotion in Ministry of Education, Culture, Sports, Science, and Technology[2] there is an 87%[3] probability for the Tokai Earthquake to happen within 30 years; 70%[4] for the Tonankai Earthquake; 60% for the Nankai Earthquake; and 70% for the Capital Central Earthquake.

The Japanese Government announced the estimated damages in case of such occurrences and has reinforced countermeasures for reducing such damages. In addition, it carried out disaster drills on September 1, 2011 with the presumption that the three massive earthquakes (the Tokai, Tonankai, and Nankai) will occur in combination. It also plans to start discussions on widespread disaster countermeasures in preparation in case those 3 earthquakes occur at the same time. However, there are still many issues and problems to work on. It is necessary to make good use of the lessons learned in the Great East Japan Earthquake to promote countermeasures that are effective in reducing damage.

85: Plates Under and Around the Japan Archipelago



Source: "Seismic Activity in Japan – Regional Characteristics Analyzed from Past Earthquakes 2nd Edition", edited by The Earthquake Research Committee, the Headquarters for Earthquake Research Promotion

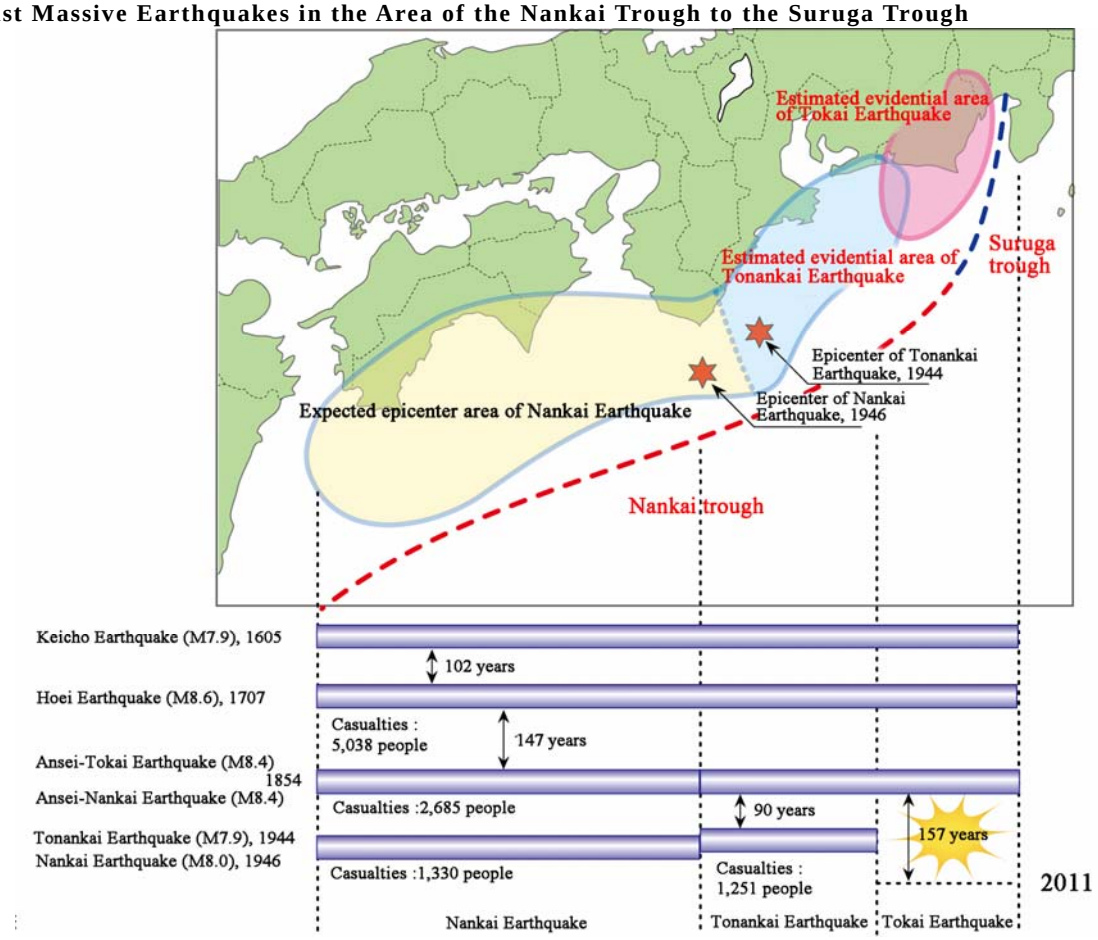
[1] "White Paper on Disaster Management 2011" by the Cabinet Office.

[2] The Earthquake Research Committee at the Headquarters for Earthquake Research Promotion evaluates activity cycles of main faults and trench-type earthquakes (earthquakes due to plate sinking), possibilities of future earthquakes (place, magnitude, and probability), etc., and it announces them occasionally. The standard calculation date for the values of earthquake probabilities shown here was January 1, 2011.

[3] As for the Tokai earthquake, its linkage with adjacent areas is still unknown. Thus, it is necessary to take different hypothesizing methods from other methods to deduce the possibility of other trench-type earthquakes. The estimate was announced as a reference.

[4] Regarding the earthquake along the Sagami trough, the occurrence possibility of the Taisho-Kanto Earthquake has been evaluated to be 0 to 2%. As for the other earthquakes of magnitude 7 or so in the South Kanto, chances are about 70%.

86: Past Massive Earthquakes in the Area of the Nankai Trough to the Suruga Trough



Source: MLIT based on materials Japan Meteorological Agency

87: Comparison of Damage from the Great East Japan Earthquake and Estimated Damage from Metropolitan, Tokai, Tonankai & Nankai Earthquakes

	East Japan Earthquake	Hanshin-Awaji Earthquake	Metropolitan Earthquake (estimate)	Tokai Earthquake (estimate)	Tonankai & Nankai Earthquake (estimate)
Moment magnitude (Mw) and intensity	Mw 9.0 Max intensity 7 (Miyagi)	Mw 6.9 (7.3) Max intensity 7 (Hyogo)	Mw 7.3 Max intensity 6 upper (Tokyo, Saitama, Chiba, Kanagawa)	Mw 8.0 Max intensity 7 (Shizuoka, Yamanashi)	Mw 8.6 Max intensity 7 (Shizuoka, Aichi, Mie, Wakayama, Kochi)
Loss of lives	20,425	6,437	Approx. 11,000	Approx. 9,200	Approx. 18,000
Evacuees (max.)	Approx. 470,000	Approx. 320,000	Approx. 7million	Approx. 1.9million	Approx. 5million
Fully-destroyed housing facilities	Approx 110,000	Approx. 100,000	Approx. 850,000	Approx. 260,000	Approx. 360,000
Damage on economy	Direct damage: Approx. ¥17 trillion	Direct damage: Approx. ¥10 trillion	Direct damage: ¥ 67 trillion Indirect damage: ¥ 45 trillion	Direct damage: ¥ 26 trillion Indirect damage: ¥ 11 trillion	Direct damage: ¥ 43 trillion Indirect damage: ¥ 14 trillion

Note:
1. The number of casualties from the Great East Japan Earthquake is as of August 11 (by National Police Agency); as for the fully-destroyed houses, as of August 11 (by Fire and Disaster Management Agency).
2. The estimated damage from Metropolitan, Tokai, Tonankai & Nankai earthquakes are the maximum values announced in the Central Disaster Management Council. The values for Metropolitan earthquakes were estimated in cases when an earthquake was centered in the northern part of Tokyo Bay.

3: The magnitude in the bracket for Hanshin-Awaji Earthquake is the value using the Japan Meteorological Agency method.
Source: MLIT from documents of the Cabinet Office

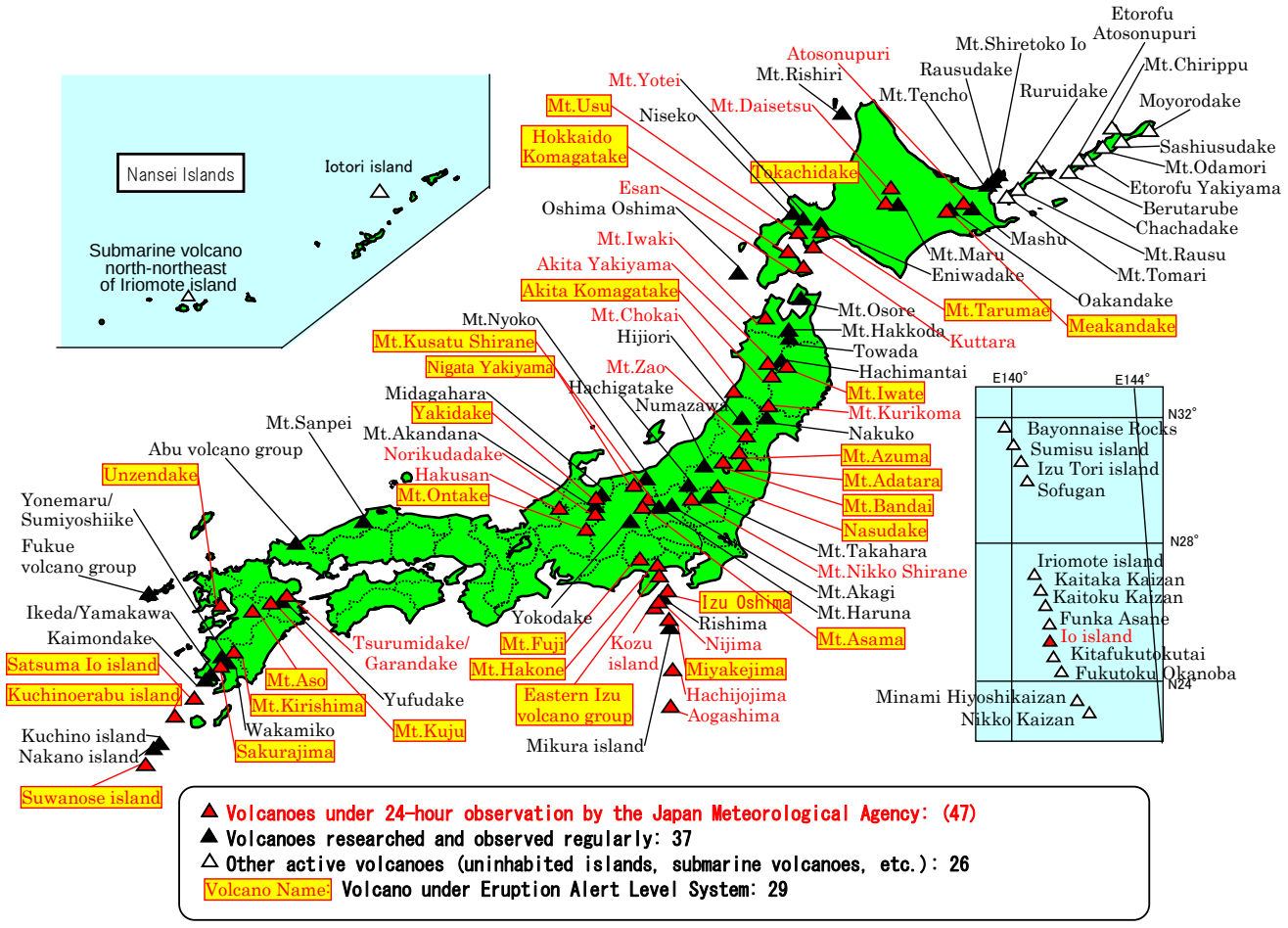
Volcanic Eruption is a Concern for Long-Term Damages

Because Japan is located over a plate-sinking zone where volcanoes are created, there are 110 active volcanoes (about 10% of all the volcanoes in the world) in the country. Thus, Japan is not only one of the most earthquake-affected countries but also is one of the most volcanic countries. Excluding sea-floor volcanoes and those on uninhibited islands, there are 84 active volcanoes. Of those, there are 47 that the Coordinating Committee of Japan Meteorological Agency for Prediction of Volcanic Eruption has decided to monitor and observe. They are being monitored 24 hours a day in cooperation with concerned entities such as universities.

On January 26 this year, Mt. Kirishima (Shinmoedake) over Miyazaki and Kagoshima prefectures started erupting for the first time in 300 years. A lot of volcanic ash was emitted in the eruption, and magma blew out from inside the crater. Since then, explosive eruptions have occurred repeatedly. In addition, in Sakurajima where brisk eruption activities have been occurring since 2009, the number of explosive eruptions was 548 in 2009 and 896 in 2010, which beat the past observatory record for 2 consecutive years.

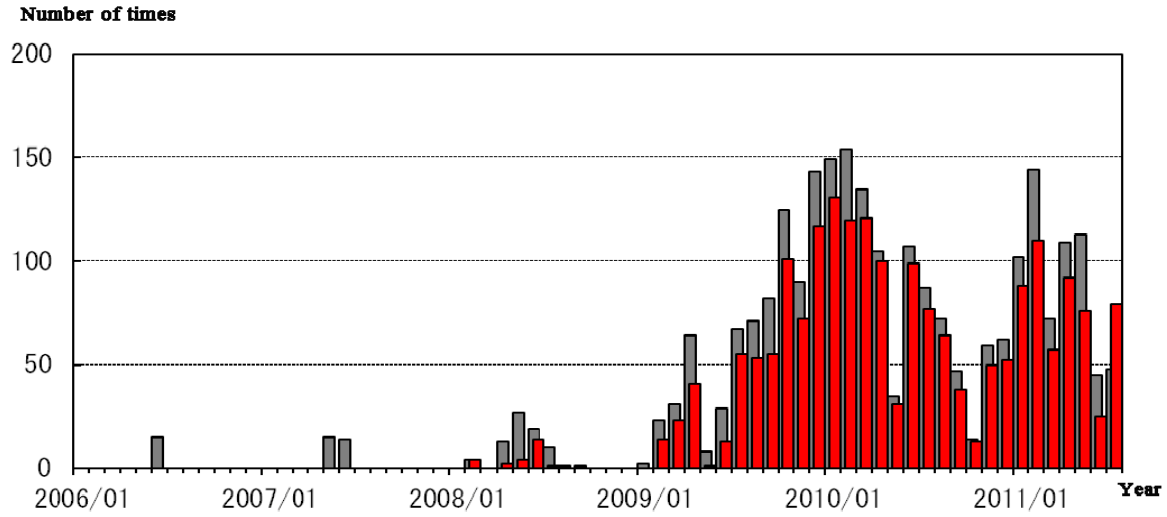
Due to the eruption on Miyake Island in 2000, 3,871 residents were evacuated and forced to live elsewhere as long as 4 years and 5 months. Because of volcanic gas, people are still restricted from living in areas close to the volcano. As it has been said, once a volcano erupts, damages might be protracted.

88: Distribution of Active Volcanoes; Monitoring and Observatory Systems in Japan



Source: "White Paper on Disaster Management 2011" of the Cabinet Office (partially modified)

89: Eruption of the Volcano in Sakurajima



Note: Numbers for monthly eruptions and explosions at Showa crater
Source: Japan Meteorological Agency

Column - Eruption of Kirishimasan (Shinmoedake)

Kirishimasan (Shinmoedake) started erupting and fierce volcanic activity began, so the Japan Meteorological Agency (JMA) raised its Eruption Alert Level [1] from 2 (crater off-limit) to 3 (mountain off-limit). Some areas were temporarily evacuated because of the abundance of ash from the eruption, which greatly influenced local life and industries such as agriculture, forestry, tourism, etc. On March 13, after the Great East Japan Earthquake, the mountain erupted and fumed 4,000m above the crater. Small lapillus of 1 to 4 centimetres fell even in areas 9km away from the crater. Since then, the mountain has been intermittently erupting.

In order to manage the situation, the Japanese government dispatched a support team consisting of members from concerned ministries and agencies, including the JMA and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). It helped affected municipalities make evacuation plans under the assumption that volcanic activity would become stronger or sediment would occur as a result of ash from eruptions. On February 25th, emergency shelters were designated to support evacuation routes and air conditioning equipment in educational and medical facilities were installed.

As a countermeasure against sediment, MLIT researched and analyzed the ash in order to support municipalities' vigilance and evacuations, and to offer information about when and where disaster might happen. After enforcement of the Amended Sediment Disasters Prevention Act on May 1, MLIT provided emergency information about landslides based on the Act. In addition, MLIT has been carrying out sediment flow detection sensors, removing earth and sand piled on existing sediment protection levees, and maintaining sediment prevention facilities.

[1] JMA has introduced "eruption vigilance level" since December in 2007, that is, 5 categories of volcanic activities depending on danger zone and necessary countermeasures for disaster protection. Each category is named as "evacuation", "prepare for evacuation", "entrance controlled", "danger around crater ", and "normal" so that residents, climbers, and entrant in the mountains can easily understand the level of danger. Now this is provided for 29 volcanoes, and it is to be introduced for volcanoes needing disaster protection measures in series hereinafter.

Frequent Occurrence of Downpours and Heavy Snow

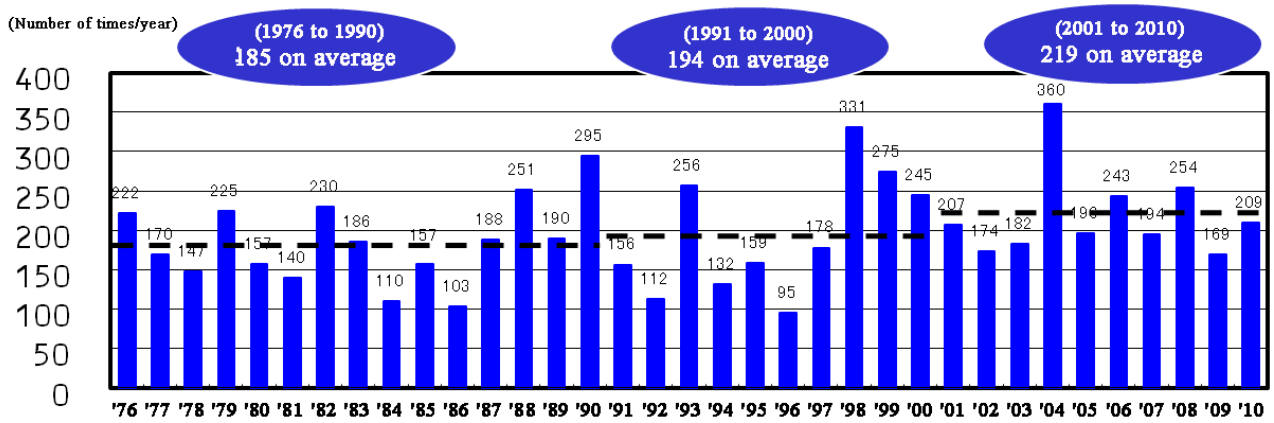
According to the Intergovernmental Panel on Climate Change (IPCC) of the UN, it is expected that flood damages will be increased as the probability of the frequent occurrence of downpours is to increase and the intensities of tropical depressions such as typhoons are to increase because of climate changes due to global warming. [1]

In fact, damages due to various abnormal climates have occurred frequently all over the world; Japan is not an exception. For example, the number of heavy rains (50mm of precipitation an hour) in short time periods – which is to be the standard for sewage capability – has been increasing in the last 30 years.

In recent years, downpours or torrential rains have been observed often in various regions of Japan. In October last year, the Amami region in Kagoshima prefecture recorded heavy rains of 120mm of precipitation an hour or 700mm over in 24 hours. During the rainy season last year [2], heavy rains of 100mm an hour occurred frequently in the southern part of Kyushu, where the total amount of precipitation reached approximately 1,500-2,000mm, equivalent to twice as much as in an average year. In Shohara City in Hiroshima, record-breaking precipitation was recorded (up to 91mm an hour and 173mm in 3 hours), and landslides and mudflows occurred in more than 200 locations within 5km in all four directions. In every one of these occurrences, flood and sediment disasters, brought great damages such as lost lives, and damaged residences, farmlands and infrastructures.

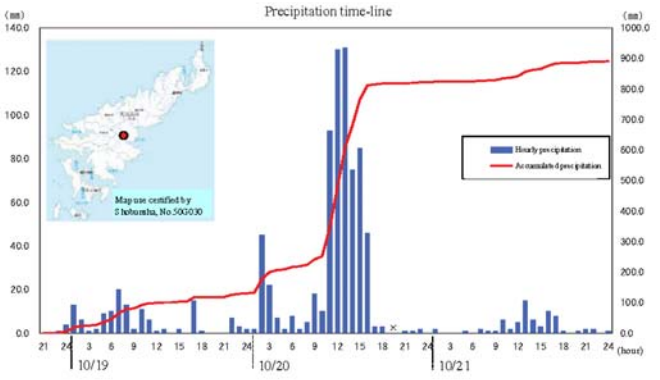
There is growing concern about the increasing danger of wind and flood damages caused by climate change due to global warming.

90: Number of Precipitation Over 50mm an Hour (per 1,000 points)



Source: MLIT based on materials from the Japan Meteorological Agency

91: Downpour in Amami Oshima in October 2010



Sources: MLIT (left) and Cabinet Office (right)

[1] "IPCC Fourth Assessment Report: Climate Change 2007 (IPCC)", November 2007
[2] Total amount of precipitation from June 11 to July 19

92: Downpour in Shobara City, Hiroshima in July 2010

Source: MLIT

During the winter of 2010, 24 locations in 14 prefectures from Hokkaido to Shimane recorded record-breaking snowfall. Such unprecedented heavy snow resulted in more damage than the winter of 2005. The total number of people killed was 131 in 16 prefectures, two-thirds of which were over 65 years old[1]. Most of the deaths happened during snow removal activities.

Because of heavy snows from December 2010 to January 2011, many vehicles were stuck on national road 49 in Fukushima, national road 9 in Tottori, and national road 8 in Fukui for long time. Railroads in the San-in region (*e.g.* the San-in Line) suspended operation, and trains stopped on the Hokuriku Line. Traffic networks and socioeconomic activities came to a halt in many areas.

MLIT tried to secure traffic and avoid closures on national roads as much as possible. However, if a large-sized car, becomes stuck, MLIT has to stop vehicular traffic early and communicate immediately with police in order to prevent a significant traffic jam.

Column - Heavy Snow at the End of January 2011

On July 30th, 2011, a record-setting snowstorm hit Fukui Prefecture. Route 8 in Tsuruga City became impassable, which made traffic between Tsukahara of Echizen City and Tayui of Tsuraga City stopped for 18 1/2 hours, until 1:30 a.m. the next day. Local municipalities and volunteers distributed drinks and food (like rice balls) to the many stranded drivers. Railways on the Hokuriku Line, also stopped operations for 2 days.

Source: Tsuruga City, Fukui

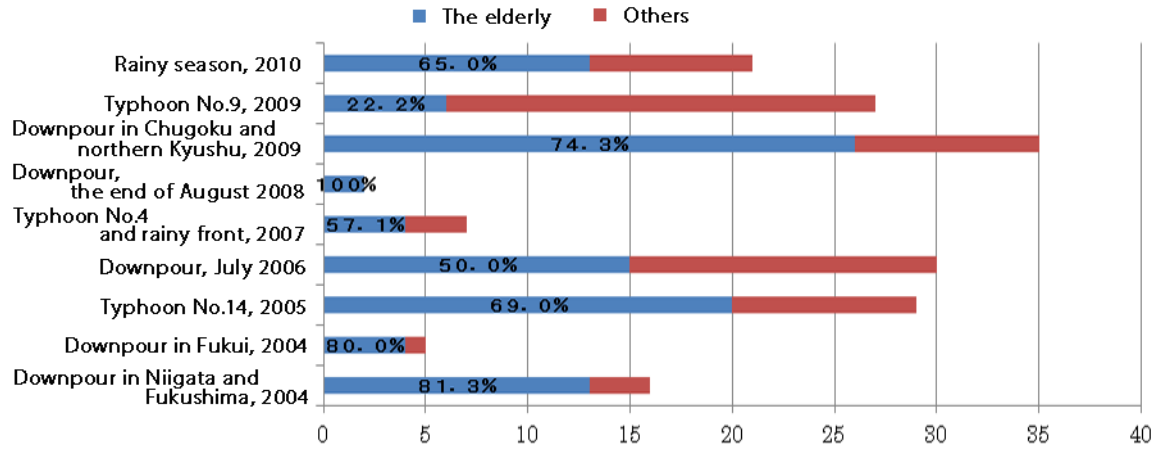
[1] According to a survey by the Fire and Disaster Management Agency (as of June 3, 2011)

2. Increasing Vulnerability of Local Communities to Disasters

Decrease in Local Disaster Prevention Capabilities

Not only changes in natural conditions, but also shifts in social environment, have become factors in increasing disaster risks. Due to the rapid aging of our society, most of victims of the Great East Japan Earthquake, the snow disasters, and recent significant wind and flood disasters were elderly people because they took more time to evacuate. Disaster prevention measures for the elderly have been urgent issues in both urban and rural areas.

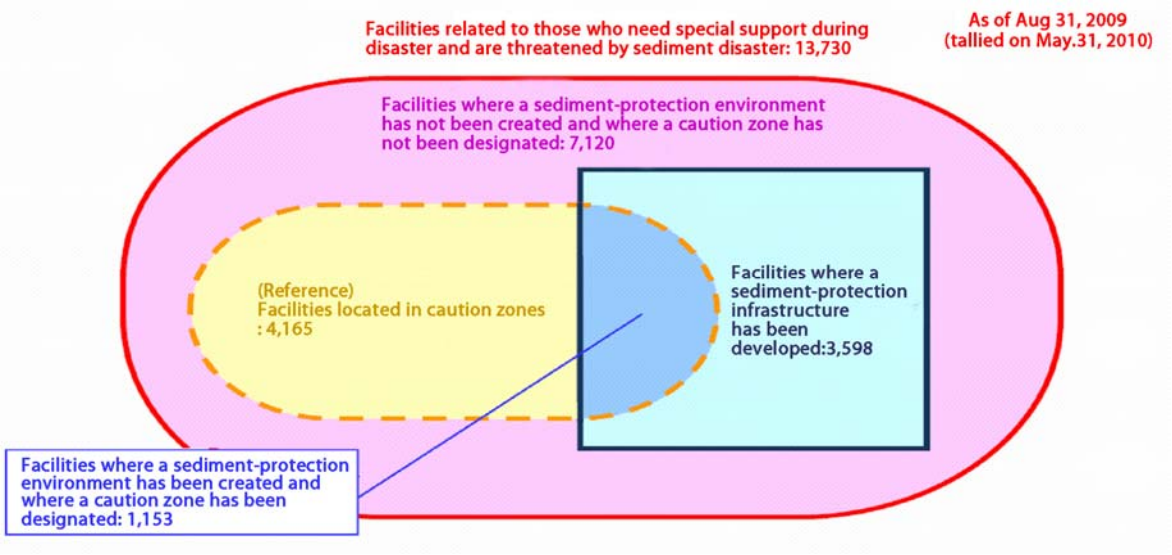
93: Proportion of Elderly Victims of Recent Wind and Flood Disasters



Note: The percentages in the graph show the percent of the elderly persons (65 or older) in the number of casualties.
Source: MLIT from the documents of the Cabinet Office

As our society ages, facilities for those who need special support (like welfare facilities for the aged) are sometimes built in places where emergency situations (such as sediment disaster) might occur. In July 2009, a massive landslide caused by downpour hit a nursing home in Hofu City, Yamaguchi, and did great harm to the facility. Considering such situations, as we implement intensive hard countermeasures, we should also prepare caution and evacuation systems, including immediate and adequate provision of disaster information. There should also be regulation of new construction in places where there is the possibility of significant disasters.

94: Facilities Related to Those Who Need Special Support and are Threatened by the Possibility of Sediment Disasters



Source: MLIT

In regards to local groups against fire and flood disasters, which have been the backbones of mutual assistance for disaster prevention capabilities in local communities, their decline due to the decrease in the number or the aging of members has become a concern. In the Hanshin-Awaji Earthquake, 80% of the people who were rescued from under debris were saved not by the fire department or police, but by neighbors. The disaster prevention capabilities of local communities can be great advantages in reducing damage, but have been declining as a result to aging and depopulation in our society.

As a result of the Hanshin-Awaji Earthquake, many people have positively taken part in support activities for victims of disasters or in disaster prevention activities. Such people have played very important roles in various fields. They are being expected to be the new local supporters for disaster prevention.

Fear of Village Isolation is Significant in countrysides

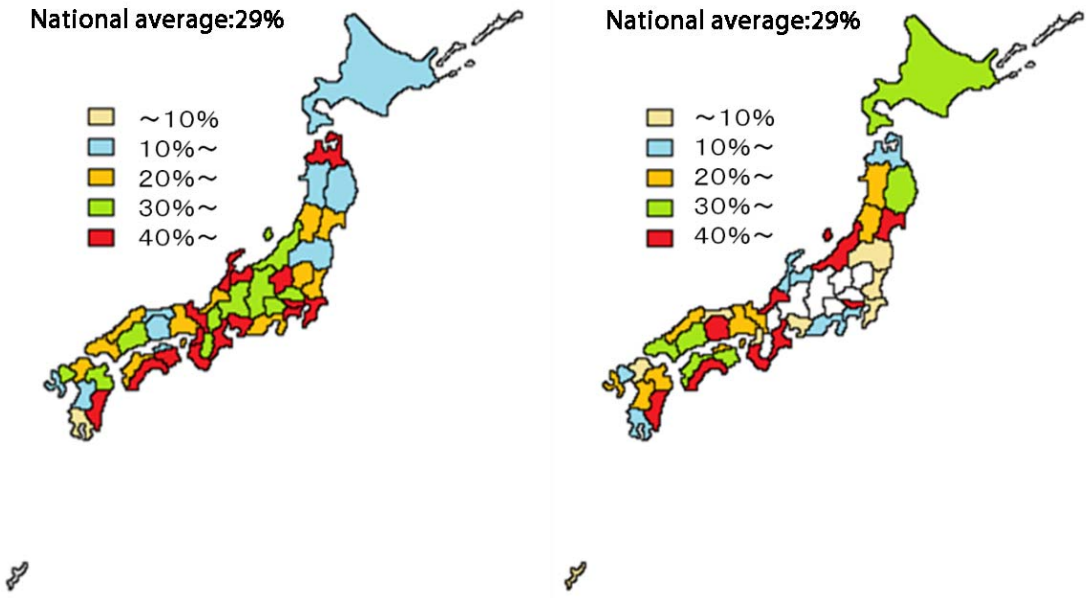
Because of the Great East Japan Earthquake, many settlements were isolated, especially in Sanriku coastal areas where rescue activities were very difficult. Many inter-mountain settlements all over Japan are now experiencing depopulation and increasing isolation risks. According to a survey conducted by the Cabinet Office in 2009[1], about 30% of agricultural and fishery settlements nationwide are faced with the possibility of being isolated during disasters: some prefectures have 50%.

These settlements' severe financial conditions are generally insufficient for preparation such as making shelters earthquake-resistant (shelters on agricultural settlements that are earthquake-resistant: 17%; on fishery settlements: 22%); storing water and food (agricultural settlements having storage of water and food: 6%; fishery settlements: 22%); and securing communication (agricultural settlements having means of securing communication: 45%; fishery settlements: 5%).

It is necessary to prepare and maintain shelters and storage of daily essentials, to take measures to secure multiple communication means, and to adequately maintain and manage roads that are local life lines.

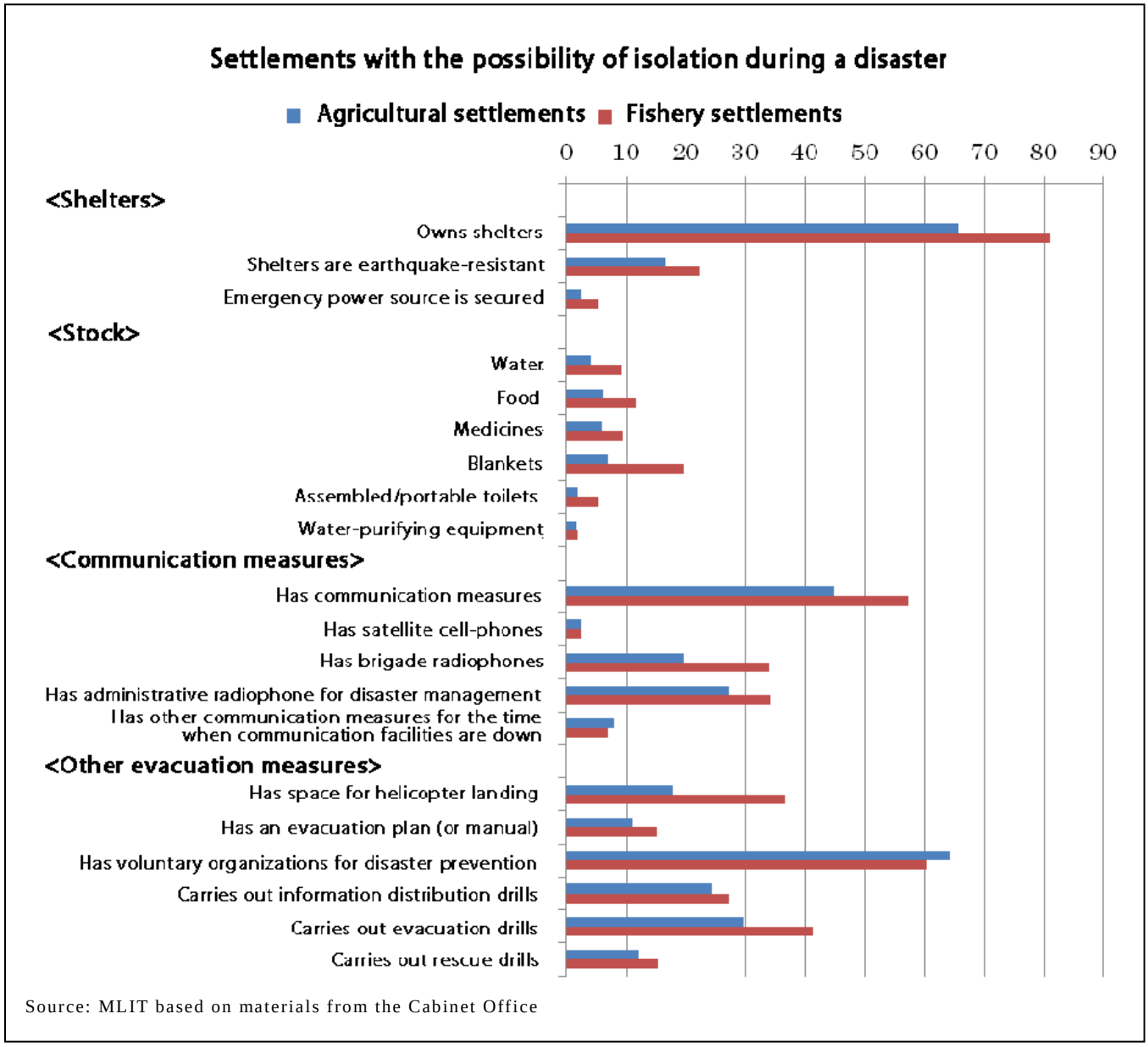
95: Settlements Threatened by the Possibility of Isolation, and Their Preparations for Disasters

Left: Agricultural settlements which might be isolated
Right: Fishery settlements which might be isolated



Source: MLIT based on materials from the Cabinet Office

[1] "Results of follow-up survey on conditions regarding occurrence possibility of isolated settlements in village-scattering areas in inter-mountain regions, etc." by Director General for Policy Planning of the Cabinet Office (in charge of disaster prevention), publicized in January 2011. "Isolation" is the situation in which access from outside by roads and maritime traffic is cut off, and the transportation of people and materials becomes hard or impossible in districts or settlements over inter-mountain regions, coastal areas, and islands, due to damages from earthquakes and tsunamis to road structures and berthing facilities for ships.



Source: MLIT based on materials from the Cabinet Office

Disaster Risks in Big Cities

As shown clearly in the Great East Earthquake, which had great effects on the Tokyo area, serious situations (*e.g.* people not being able to return to their homes) may occur in big cities when there is an earthquake because of their dependency on electrical power, public transportation, and widespread panic may ensue.

If the capital central earthquake occurs, about 6,500,000 people are expected not to be able to return to their homes in Tokyo, Saitama, Chiba, and Kanagawa. [1]

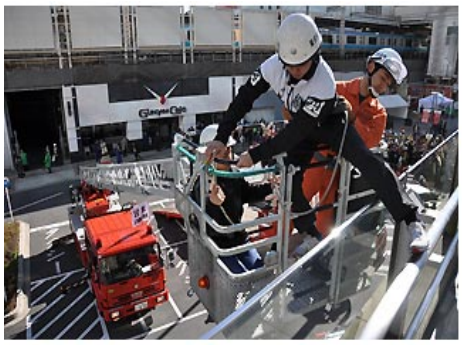
A corporation or a municipality can not manage these issues alone. Therefore, the public and private sector must take thoughtful and detailed approaches in cooperation with local communities on the presumption that the worst will happen.

[1] "Expert Research Report on Countermeasures against Capital Central Earthquake" by the Central Disaster Management Council of the Cabinet (July 2005)

Column - Communal Efforts to Prepare for Commuters Unable to Return Home (Chiyoda Ward, Tokyo)

Chiyoda Ward holds a great deal of facilities that function as political and economic centers of Japan. Day population there reaches about 850,000. Therefore, if and when a metropolitan earthquake occurs, it is estimated that about 570,000 commuters will have difficulty getting home. In preparation for such a situation, 6 support centers have been designated to provide victims with temporary shelter, food, and information. Centering around 4 terminal stations such as Tokyo Station, Local Cooperative Task Forces consisting of residents and local business operators have been created. In cooperation with Chiyoda Ward, organizations have been carrying out disaster drills for evacuation guidance and material support.

In the case of the Great East Japan Earthquake, many employees and shoppers were unable to return home from commercial buildings around Tokyo Station. However, Task Forces made good use of results from their past efforts and preparation, and offered stocked blankets and vacant spaces as temporary shelters. Moreover, voluntary cooperation was made; for example, restaurants provided meals.



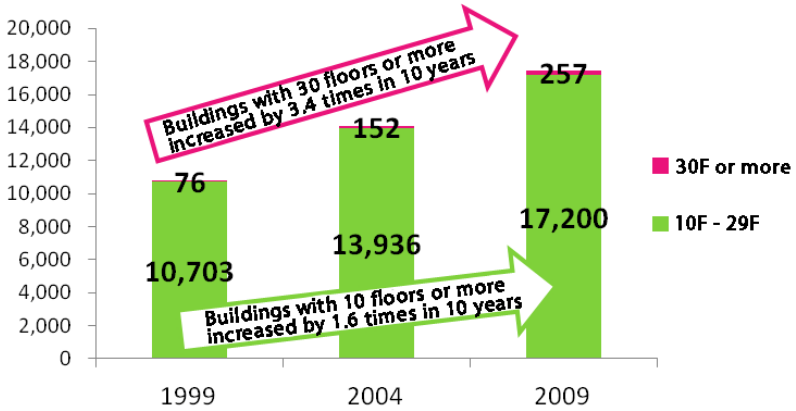
Source: Chiyoda Ward, Tokyo

Changes in city structures such as an increase in the number of high-rise apartments and tall buildings, and the enhanced usage of underground space, are factors in increasing the risks during disasters.

With tall buildings, there are risks of damages caused by huge shaking from long periods of ground motion [1] (as was experienced during the Great East Japanese Earthquake), and of people being trapped in elevators. Even if buildings are earthquake-proof, people on higher floors might be isolated and have difficulties surviving due to temporarily being cut off from lifelines such as electricity, water supply, and sewage systems or due to failure of facilities like elevators. In Tokyo alone, the number of buildings having more than 10 floors has increased by 1.6 times in the past decade (1999 – 2009), and the number of buildings having more than 30 floors has increased by 3.4 times. This means that more and more people live in high-rise buildings, and there are more risks of people being displaced.

Measures need to be taken to deal with the risk of people being displaced during a disaster. Some local municipalities in Tokyo are trying to require newly-developed tall buildings to prepare storage rooms.

96: Increase of High-Rise Buildings in Tokyo



Source: MLIT based on the "Tokyo Statistical Yearbook"

[1] When a large-scale earthquake occurs, long-period seismic waves occur and reach places far from the epicenter. In plain areas, those waves are amplified depending on ground foundation, which might lead to a longer shaking duration. Since ultra high-rise buildings have longer durations of shaking, they tend to reduce the force at an earthquake in comparison to general ferro-concrete buildings with shorter proper characteristic periods. However, long-period waves shake tall buildings slowly for a long time. Therefore, less-fixed OA equipment, etc. may move greatly and people may not be able to stay in one place without holding on to something that is firmly fixed.

Underground space in big cities for subways and underground shopping complexes involves the risk of flood damage from heavy rains. In 1999, half of the underground mall at Hakata Station was inundated by downpour and resulted in casualties. The torrential rain in Tokai in 2000 submerged a subway in Nagoya City, which caused trains to stop operations for up to 2 days. If a large-scale flood hits the capital region, it is estimated that there will be huge damages. [1] For example, subways might be submerged along 147km of 17 lines (97 stations) due to a washout of Arakawa (Ara River) embankments.

There are 2,900 underground facilities around Japan. When a torrential rain occurs, about 1,300 (over 40%) may be inundated. [2] In order to reduce the possibility of flood damage in underground facilities used by an unspecified number of people, local municipalities should set plans for communicating flood forecasts, and securing evacuation measures. These approaches have still been insufficient. It is necessary to take further measures to reduce flood damage in underground facilities through water prevention measures at entrances of subways stations, etc.

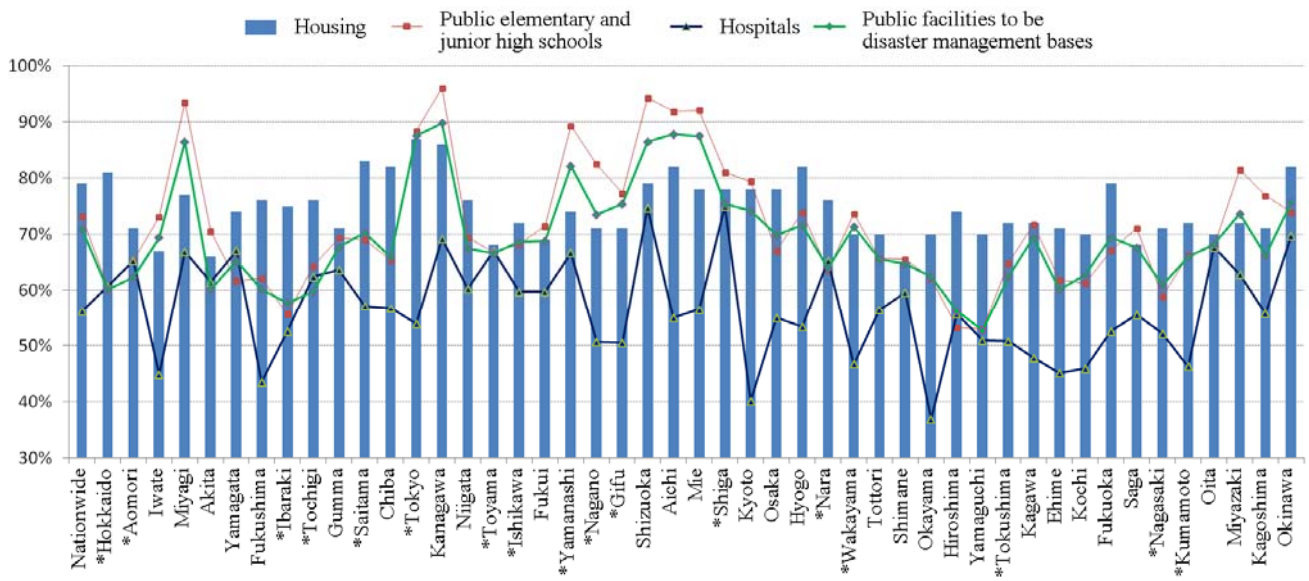
Insufficient Earthquake Durability and Dilapidation of Housings and Infrastructures

The most effective countermeasures to save lives during earthquakes is to make livelihood spaces safer by making housings, buildings, and public infrastructures to be earthquake-resistant.

There are still many housings and buildings that were built before 1981 – when a new earthquake-proof standard was established – whose resistance for shaking is not enough. It is an urgent issue to promote their shaking-durability, in order to save lives and prevent those housings and buildings from falling (which becomes an obstacle for rescue activities).

As seen during the Great East Japan Earthquake, public infrastructures such as roads, ports, airports are very important for rescue and temporary restoration activities. However, their shaking-durability is not sufficient, and it is necessary to progress intensive approaches on this issue.

97: Seismic Retro-Fitting of Housings and Buildings, by Prefecture



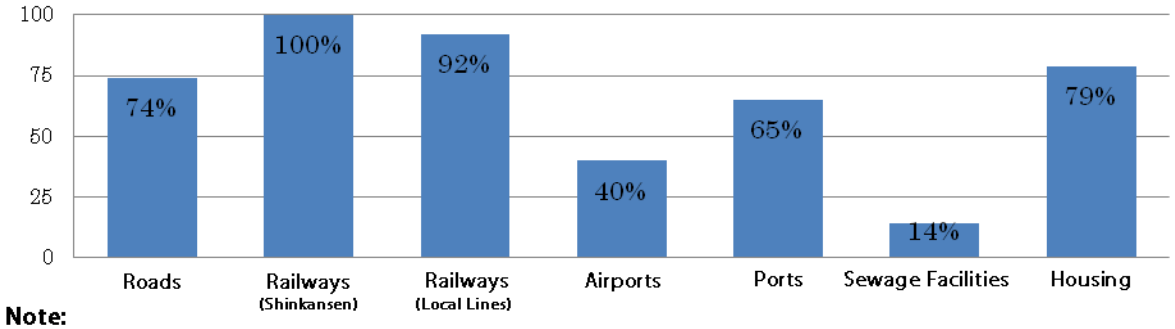
Note:
1. Housings: as of 2008; public elementary and junior high schools: as of 2010; hospitals: as of 2009; public facilities to be disaster management bases: as of 2010
2. Proportions of housing retro-fitting were partially from reports from the prefectures. The proportions in prefectures with * were estimated by MLIT.

Source: MLIT based on materials from MLIT; the Ministry of Education, Culture, Sports, and Technology; the Ministry of Health, Labor, and Welfare; and the Fire and Disaster Management Agency.

[1] "Report of Expert Research Council Regarding Large-scale Flood Disaster" by the Central Disaster Management Council of the Cabinet Office (April 2010)

[2] Survey by the Ministry of Land, Infrastructure, Transport, and Tourism (as of the end of October 2007)

98: Seismic Retro-Fitting on Public Infrastructures



Note:

Roads: Emergency transportation roads (expressways, national roads, and artery roads connecting the above; other roads connecting the above roads and governor-designated facilities; and the connecting roads between those facilities). As of 2009.

Railways (Shinkansen): Elevated bridges, stations, tunnels

Railways (Local Lines): Elevated bridges (as of 2009)

Airports: Population co-variances that are within 100km from an airport that can be utilized for emergency transportation As of 2009.

Ports: Earthquake-proof quay walls of ports whose area holds a certain number of people; ports depending on marine transportation for emergency supply due to geographical factors; ports on isolated islands having a ferry route that is necessary to maintain during a disaster (as of 2010)

Sewage Facilities: Important pipeline facilities, etc. (main lines in watershed areas; pipes receiving wastewater from disaster protection bases and shelters; pipes directly connected to pump stations and treatment facilities; pipes buried under emergency transportation routes railways). As of 2010.

Source: MLIT

Japan's financial restraints have been increasing due to an economy that has been stagnant for long time. The government's debt has been rapidly increasing, and expenditures have greatly exceeded revenues. As a result, expenditures for public works have been largely reduced in recent years.

99: Percentage of Infrastructure over 50 Years since Construction

	2009	2019	2029
Roads, Bridges	Approx. 8 %	Approx.25%	Approx.51%
River Management Facilities (Watergates,etc.)	Approx.11%	Approx.25%	Approx.51%
Pipes for Sewage	Approx. 3 %	Approx. 7 %	Approx.22%
Quay Walls of Ports	Approx. 5 %	Approx.19%	Approx.48%

Source: MLIT

Furthermore, the number of decrepit social capital stocks that were intensively created during the country's high-growth period is rapidly increasing. Their inadequate management and renewal, and their failure to perform their role as social capital to support security and safety can lead to increasing concern about enlargement of disaster damages.

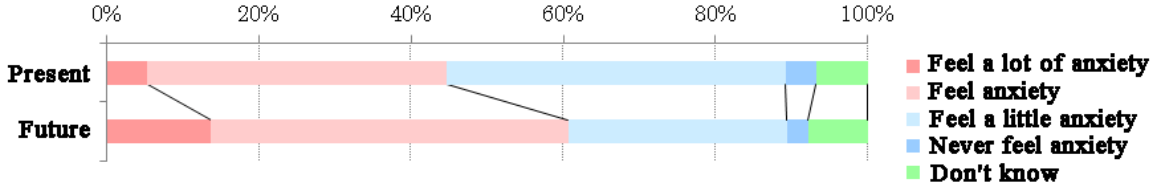
According to an awareness survey conducted by MLIT [1], 45% of the population is feeling "much anxiety" and "anxiety" about current situations and 61% about future situations. In addition, those surveyed expressed that they have "much anxiety" about items including: "Risks in a disaster increase"; "Daily life is disturbed"; "Local industries are weakened"; and "Residents move out of neighborhood".

Going forward, strategic management and renewal are required for the increasingly aging social capital stocks in order to prevent national and regional lands from losing their safety and vitality under severe financial conditions. It is necessary to accelerate prevention and protection measures like the planned maintenance, for longer usability.

[1] Same as footnote 39

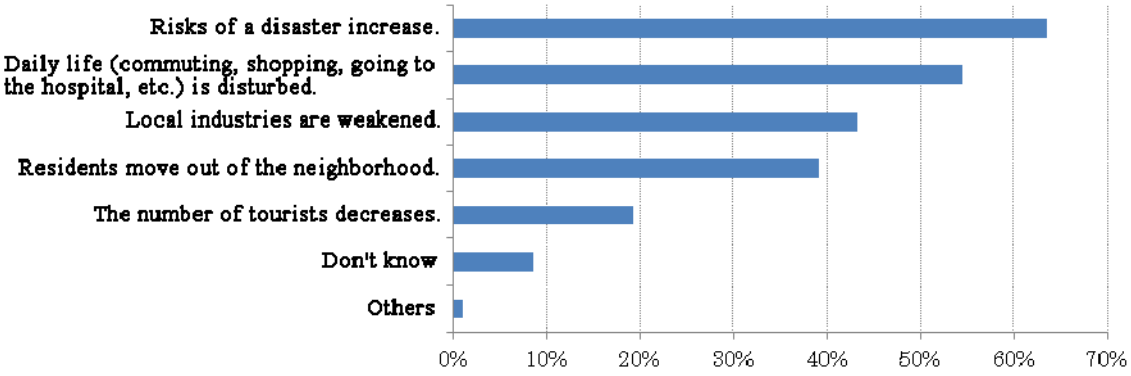
100: Anxieties About the Maintenance and Renovation of Infrastructures (MLIT Opinion Survey)

Q: When existing infrastructures (roads, ports, airports, river management facilities, parks, etc.) deteriorate, we have to repair them or construct new ones (maintenance/renewal). Do you have any anxieties about maintenance or renewal of infrastructures at the moment? Do you think you will have anxieties about maintenance or renewal of infrastructures in the future?



Source: MLIT

Q: If maintenance or renewal of infrastructure (roads, ports, airports, rivers, parks, etc.) are insufficient, what problem do you think will arise? Choose all problems.



Source: MLIT

Decline of Public Function in the Construction Industry to Support Local Safety

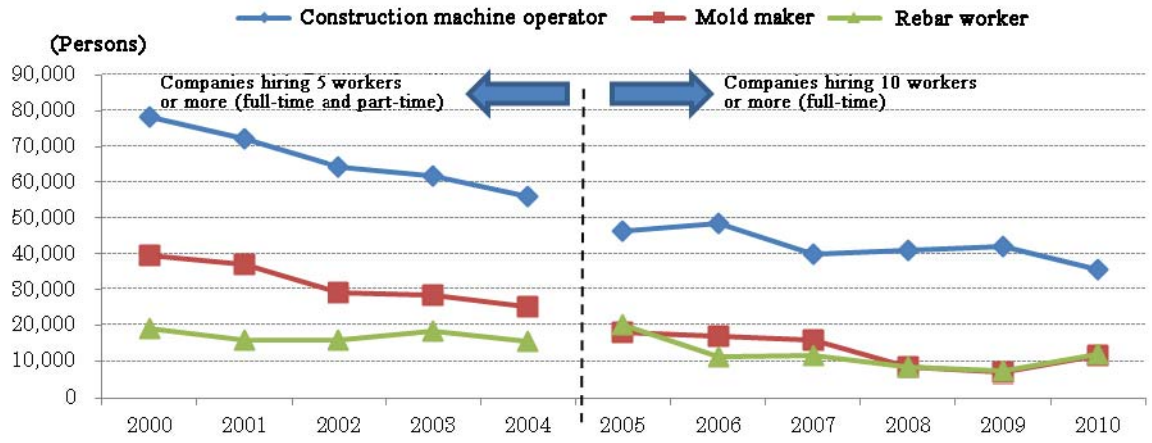
Industries related with MLIT (*e.g.* construction, transportation, etc.) have not only supported local economies and employment, but have also played important roles in local development and the securing of the safety of livelihoods by acting as agents for various activities such as disaster-protection, crime-prevention, local events, etc.

Each organization in the construction, real estate, transportation, and hotel businesses entered into disaster-protection agreements with local municipalities to provide equipment and manpower during disasters; offer residences to victims; transport emergency supplies; provide temporary accommodations for victims, etc.

However, these industries have been suffering from severe conditions in management and employment due to the changes in the socioeconomic situation in Japan and accompanying structural change of the industries. In addition, the number of people engaged in such industries have been decreasing and aging. Especially in skilled labor fields, inheritance of skills and techniques has been a big issue.

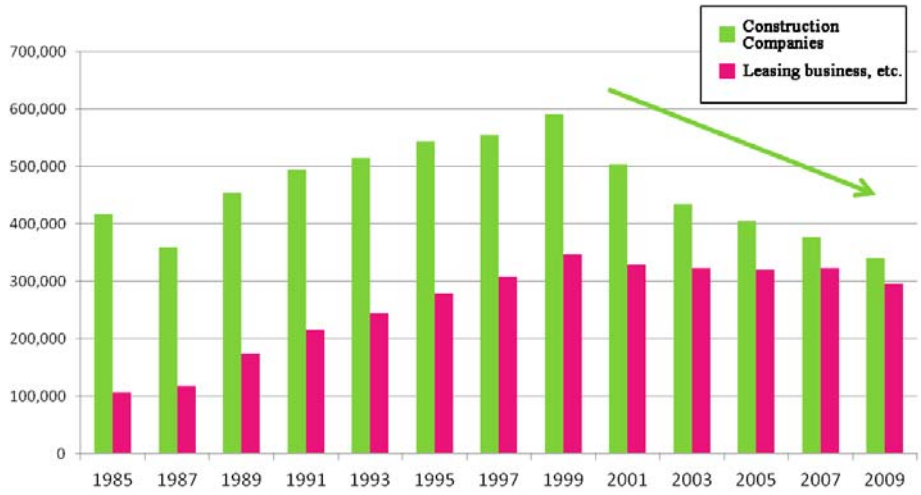
Due to such situations, there have been problems in the construction industry, which contribute to the temporary restoration of residences, buildings, and infrastructures during disasters, and to the building of temporary housing facilities. It has been facing issues with securing skilled labor, such as construction machine drivers, pattern cutters, and iron workers.

101: Trends in Skilled Labor in the Construction Industry



Source: MLIT, based on the "Wage Survey of Outdoor Workers by Occupation" (2002 to 2004) and the "Basic Statistics on Wage Structure" (after 2005) of the Ministry of Health, Labor, and Welfare

102: Trends in Construction Equipment Retention



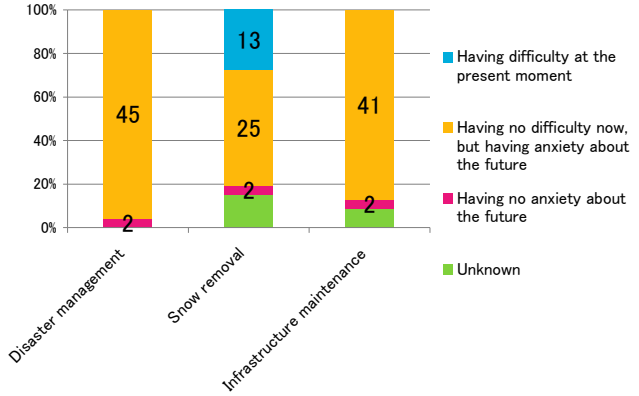
Source: MLIT

In addition, the number of machines that construction companies own has been decreasing since the peak in 1999. Now, more and more are owned machines by lease businesses.

According to a survey conducted by MLIT in January this year, the number of construction companies, which are the companies that secure sufficient manpower and equipment to take measures against disasters, to plough, and to manage and maintain infrastructures, has decreased, especially in rural areas. That causes concern for securing safety in local communities.

It is necessary to bring forward measures to prepare the environment where local construction companies that have excellent techniques and management skills can sustain independent management.

103: Anxiety About Disaster-Related Operations of Construction Companies



Note: The numbers in the graph show how many prefectures responded.
Source: MLIT

3. Reinforcement of Countermeasures Against Tsunamis

The Great East Japan Earthquake resulted in one of the worst devastations from a tsunami in the country's recorded history. Many tsunamis have occurred around Sanriku coastal areas and have brought about devastation. The disaster of this tine showed that preparations that had been made were still not enough. Although various instructive events were carried out the last year to pass along the severe lessons of the tsunami caused by the Chile Earthquake in 1960 (commemorating the 50th anniversary of the disaster).

The massive tsunami damages following the Indian Ocean Tsunami showed its destructive force to the nation and the whole world. We must recognize characteristics of tsunami disaster and verify what was useful with conventional protections and what was insufficient in consideration to current conditions of tsunami protection in order to make further efforts toward reducing tsunami damages.

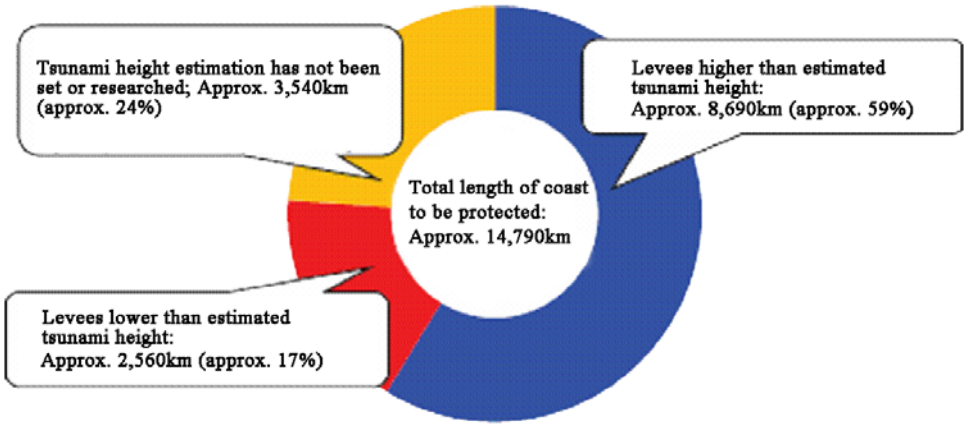
The lessons learned from this huge tsunami which destroyed breakwaters, sea levees, coastal embankments, and seawalls, and which surged over inundation-estimated areas to swallow designated shelters was that it is necessary not only to review conventional tsunami estimation, but also to intensively reinforce countermeasures for tsunami evacuation to save lives over circumstances beyond assumption, without believing that the existing countermeasures such as breakwaters, sea levees, coastal embankments, seawalls, and hazard maps are ehough. [1]

Since tsunami disaster has a much lower frequency compared to damages by heavy rains, it is important to pass along to the next generation the lessons learned from the sorrowful disaster.

Issues with Current Tsunami Protection

Conventional measures against tsunamis have been the construction and maintenance of sea levees and seawalls. As for the current height of the sea levees, out of about 15,000km in total of seacoast protection facilities all over Japan, about 59% are higher than estimated tsunami heights; about 17% are lower; and for the remaining 24%, estimation tsunami heights have not yet been set or surveyed.

104: Coastal Levees and Coast Protection Facilities



Source: MLIT and the Ministry of Agriculture, Forestry, and Fishery (as of March 2010)

Even if it is almost impossible to restrain the largest class tsunami like one caused by the earthquake last year, it is necessary to firmly promote the building and maintenance of facilities as having an effect in the reduction of the power of tsunamis (depending on actual situation in each area and with consideration to the validation of damage situations of the facilities destroyed by the tsunami).

As for soft policies, it is important to create a tsunami hazard map showing that which areas in the regions would be jeopardized, depending on the height of the tsunami, and the effects of breakwaters, sea levees, coastal embankments, and seawalls. The danger level of the estimated inundation area and facilities, can be precious information for evacuations.

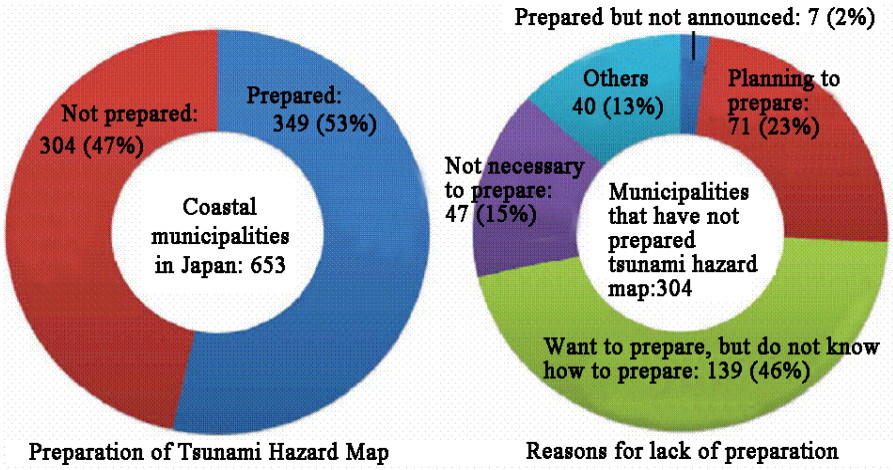
Based on the lessons learned from the huge tsunami, scale estimation is a big issue. However, preparation for the creation of tsunami hazard maps are not yet sufficient. Only 53% of 653 coastal municipalities have prepared

[1] The "Middle summary – basic concept for countermeasures against tsunami disaster – "and "suggestion accompanying the middle summary" announced by the Central Disaster Management Council of the Cabinet Office on June 26 says, "We should change conventional ways of thinking, and we should discuss massive earthquakes and tsunamis of largest class by considering every possibility based on scientific knowledge such as surveys on tsunami sediment" regarding how to estimate damages of earthquakes and tsunamis. It also says, "It is an urgent task to establish comprehensive tsunami countermeasures with all and every measure including land use, the building and maintenance of shelters and disaster protection facilities for locals' evacuation."

tsunami hazard maps. In addition, only 41% of those municipalities have formulated concrete plans regarding tsunami evacuations. Municipalities say they have not taken such measures because they don't know how to create hazard maps or evacuation plans. That means they need some technical support to progress these measures.

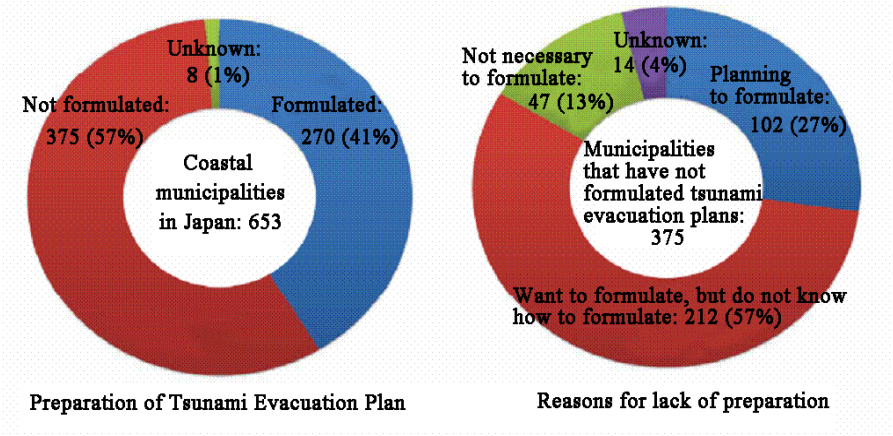
It is necessary to promote the preparation of tsunami hazard maps, and to try to enhance and amend existing maps.

105: Preparation of Tsunami Hazard Maps



Source: Cabinet Office (as of March 2010)

106: Formulation of Tsunami Evacuation Plans



Source: Cabinet Office (as of March 2010)

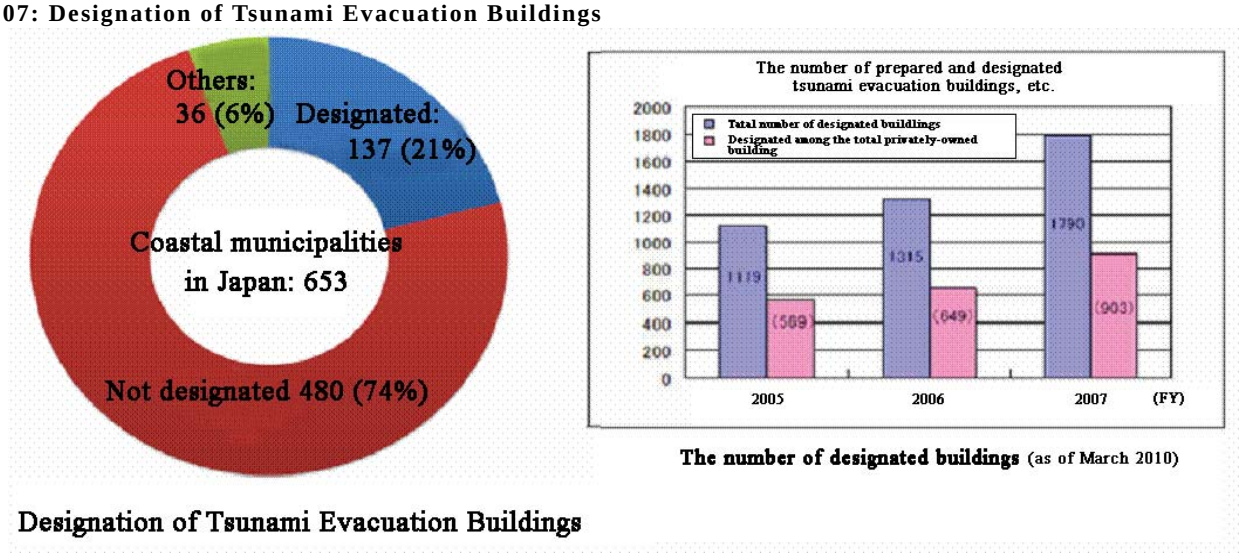
Reinforcement of Tsunami Evacuation Measures

While reinforcing and enhancing such hard and soft measures under a certain assumption, we need to strengthen immediate evacuation measures intensively to save lives by any means, keeping in mind situations beyond estimations.

The best policy to escape from a tsunami is to immediately run up to grounds as high as possible. For that, checking evacuation places and routes is essential. Especially in the case of tsunamis caused by earthquakes whose epicenter was near (which doesn't allow a long time to evacuate), desirable evacuation destination is not farther but higher. It is also a big issue to take utmost consideration for evacuation support for disaster-affected destinamtion people such as the elderly, the disabled, pregnant women, infants, etc. It is necessary to consider whether evacuation to higher ground outside of the inundation area is possible, depending on actual situation in the area. If such measures can not be taken or there is no higher ground within the inundation area, securing strong, high-rise buildings, should be required.

Only 21% of municipalities have designated tsunami evacuation buildings; 74% have not taken such measures. However, the number of designated buildings has been increasing year by year, and almost half of those are private facilities. It is necessary to promote the usage of existing buildings (including private buildings or condominiums),

107: Designation of Tsunami Evacuation Buildings



Source: Cabinet Office (as of March 2010)

Column - Tsunami Evacuation Building Saved Residents

In the areas affected by the Great East Japan Earthquake, buildings which had been designated as tsunami evacuation buildings were surged and inundated. However, there were some cases in which locals were saved by those buildings.

In Kamaishi City, locals in the neighborhood ran into "Kamaishi Biru", a city-run building of 8 stories, and one of the buildings designated as a tsunami evacuation spot for residents. The huge tsunami surged up to the third floor. However, the fourth floor and higher floors were not damaged, and the people who came into the building were saved.

Another case is the town-run Matsubara Residence of 4 stories, which faces Sizugawa Bay in Minami-Sanriku Town, Miyagi, and was designed and constructed as a tsunami evacuation building. Although the tsunami reached the roof, the building itself was not destroyed, and the people inside narrowly escaped.

It is necessary that we research the actual damage done by the tsunami in order to designate more evacuation places and make them safer.

Tsunami Evacuation Building in Sanriku Town, Miyagi

Source: The Disaster Control Research Center, Graduate School of Engineering, TOHOKU University

If we feel strong shake or weak but long shake near the sea coast, it is very important to evacuate voluntarily and immediately. However, there are cases where people cannot feel shaking because an earthquake's epicenter is far, such as in the case of the tsunami caused by the Chile Earthquake in 1960 and the tsunami caused by the Chile Middle Coast Earthquake in February 2010. Also for such cases, it is necessary to enhance monitoring and observatory systems regarding the occurrence or the forecast of tsunamis, or communication systems for accurate disaster and evacuation information.

The Japan Meteorological Agency has built a database for tsunami forecasts that has 100,000 results of simulated calculation, and it tries to provide announcements of tsunami warnings or cautions just a few minutes after the occurrence of earthquake. In addition, the JMA cooperates with concerned organizations including 77 tide level observatories that the JMA installed on its own accord and GPS wave gauges that MLIT port bureaus installed offshore (12 points) to announce observed values such as height of tsunamis at 184 locations nationwide. However, some of these observation facilities were destroyed, and the monitoring and observation of tsunamis were partially impeded in the Great East Japan Earthquake. It is therefore necessary to progress the building and maintenance of monitoring and observation systems which are more disaster-resistant.

Municipalities also provide information like evacuation instruction based on tsunami warnings. For this, it is required to secure various communication measures like the usage of cell phones, as well as community wireless systems.

Even though the reinforcement of such approaches is necessary, what is essential is how quick actual evacuation is taking place. At the time of the Chile Middle Coast Earthquake in 2010, despite the tsunami warnings (the first time in 17 years), the low percentage of residents' evacuation or municipalities' evacuation instructions were pointed out to be problems. [1] With disasters having low frequencies (*e.g.* tsunamis), there is a fear that people will underestimate the disaster or the evacuation information and, expecting only a minor tsunami, not take any action. Therefore, concerned organizations should work closely together to discuss how to provide local residents with trustable disaster and evacuation information, including effective hazard maps.

General Mobilization of All Policies Regarding the Creation of Tsunami-Resistant Towns

It is necessary to forcefully promote measures for tsunami protection based on the lessons learned from the Great East Japan Earthquake in accordance to town planning in order to overcome the problems mentioned above. This is not only the basic concept of the restoration of the areas affected by the Great East Japan Earthquake, but also of the prevention of similar tragedies in the areas which are fearing about the possible occurrence of the Tokai, Tonankai, or Nankai earthquakes.

MLIT plans to take approaches towards the creation of systems which promote "tsunami-resistant town building" with "multiple protections" combining policies of hard and soft policies and with consideration to the characteristics of each area, based on the "Proposal for Restoration – Hope in Disaster" by the Advisory Committee Tasked to Work out a Vision on Countermeasures for the Great East Japan Earthquake; the "Basic Policy for Restoration from the Great East Japan Earthquake" based on the above proposal; discussions in expert research meetings regarding earthquakes and tsunami countermeasures based on the lessons from Tohoku Earthquake in the Central Disaster Protection Council of the Cabinet Office; the "Concept for Building Tsunami-Resistant Towns" from the planning section in the Traffic System Subcommittee of the Council for Transport Policy and Social Capital Developed Council of the MLIT.

[1] According to the survey the "Emergency Questionnaire to Local Residents regarding Evacuation from Tsunami Caused by the Earthquake Whose Epicenter was Middle Coast in Chile" that was conducted by the Cabinet Office and the Fire and Disaster Protection Agency in March 2010 (respondents: residents of municipalities in Aomori, Iwate, and Miyagi where tsunami warnings were received), 37.5% of people evacuated (including evacuating to any place other than designated premises or going out to safe areas the tsunami could not reach), and 57.3% of people did not evacuate (even though they recognized the necessity to evacuate) or did not think about evacuation at all.

4. Issues with Mitigating Damages Caused by Large-Scale Disasters

Establishment of Response system for Problem-solving under the Estimation of Disaster Damages. In the Great East Japan Earthquake, not only did a huge earthquake and massive tsunami occur, but there were also nuclear power plant accidents that turned out to be an unprecedented, widespread and complex disaster. For these disasters that happened one after another, emergency countermeasures were continuously required. Since the Hanshin-Awaji Earthquake, the progress was seen in the reinforcement of disaster protection systems (such as initial and crisis management systems) and the large-area rescue systems; various disaster agreements between public and private sector. However, especially in a widespread disaster over a large area like this time, it is necessary to enhance preparations for systems that can tackle problems immediately and efficiently. The primary policy, after checking problems to be managed urgently and intensively in advance, should be to save lives, on the presumption that there are a variety of situations where hard and soft measures taken preliminarily can be useless.

The cooperation of concerned organizations is vital in understanding damage conditions or rescue activities; strategic management for temporary restoration of land; maritime and aviation transportation in order to secure urgent transportation networks; the securing of shelters or travel support for a great deal of evacuees and persons who cannot return to their homes under trains operation suspension; emergency supply transportation towards spotted shelters and other victims; efficient transportation and logistics for the normalization of livelihood and economic activities in the affected areas; and the securing of land, materials, and manpower for immediate construction of temporary housings. Now we are required to research and verify the lessons learned from the Great East Japan Earthquake to reinforce cooperative and collaborative systems between the private and public sectors.

Establishment of Large-Area Traffic and Transportation Networks to Act as Lifelines During Disasters

In regards to emergent countermeasures during this disaster, one of the most required activities was, as well as lifesaving, securing traffic and transportation networks immediately to help people evacuate. We recognized the importance of disaster-resistant large-area traffic and transportation networks.

If the predicted earthquakes in the capital central area, and the Tokai, Tonankai, and Nankai areas happen, great damages over widespread areas may occur. Large-area networks for traffic and transportation will be the lifeline during such disasters. In order to secure them, we should take general and comprehensive measures.

Included in the hard measures is the promotion of construction and the retro-fitting of earthquake-resistant infrastructure facilities so that traffic and transportation will not be damaged. In addition, it is necessary to formulate traffic and transportation systems according to the actual situations of each area and with consideration to multiple routes that could still function as a network even if parts of it are damaged.

Included in the soft measures is the sharing and storage of supplies, and the coordinated procurement and transportation system by land, maritime, and aviation. We need to discuss ideal cooperative systems between the public and private sectors, and the enhancement of systems that collect, provide, and share traffic information (including the usage of IT technology like GPS). Taking into consideration the possibilities that information infrastructures may be damaged or that local municipalities in the affected areas can not function themselves, systems that can be used on the spot when a disaster happens need to be developed.

Shift to Disaster-Resistant National and Regional Structures

Along with the above said review and reinforcement of various disaster protection measures and buildup of large-area traffic and transportation networks, we need to discuss how national and regional spatial structure should be in terms of duration against widespread, massive disasters.

In the period after World War II when disasters of the Great East Japan Earthquake scale did not occur, cities had expanded in dangerous areas for disasters against a background of soaring populations and rapid economic growth. Created was an overconcentration and a one-axed national land structure where a large population and important functions are gathered in the Pacific Belt Area with Tokyo in the center.

On the other hand, before this earthquake, Japan had entered an era of structural change in the socioeconomic environment – such as depopulation, a decreasing birthrate coupled with an aging society, an enormous financial deficit, aggravation of international competition due to other Asian nations' rapid growth, etc. – and it was just searching for how it should realize sustainable development.

Considering the said problems, discussions about the correction of and the shift from overconcentration and a one-axed national land structure have been carried out. After this last disaster, worries about the vulnerability of such national spatial structure have been increasing. We need to rebuild national and regional spatial structures so that the security and safety of people's lives and livelihoods are not jeopardized, and we need to deliberate on deconcentration and backups for various functions.

Nationwide, we need to promote the revitalization of all of Japan and further rebuild flexible, disaster-resistant national spatial structure by building shared and complementary relationships among various functions in an independent and decentralized manner in the form of helping each area's development, including the restoration and reconstruction of the Tohoku region where there was great devastation from the Great East Japan Earthquake.

Furthermore, in regards to building local communities or towns, it is necessary to review how to fundamentally use lands, how to spatially align various facilities in terms of nationwide disaster reduction with consideration to a variety of changes in each region, and how to establish a diversity of disaster protection measures.

MLIT also supports the development of disaster-resistant regions conducted mainly by each local area with new systems for tsunami protection and town building.